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THE FOREST TREES

OF

TRAVANCORE

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THE

FOREST TREES

OF

TRAVANCORE

BY

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CONSERVATOR OF FORESTS, TRAVANCORE

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TRIVANDRUM

1908

Kummannur Plantation 40 years old (in 1908).
Undersown with Anjili (Artocarpus Hirsuta) 3 years old.

INTRODUCTION.

My object in writing this book has been to place in the hands of every Forest Officer who understands English, and of all who are interested in the Flora of this country, a means of easily identifying any tree that may be met with. It is usual in a book of this sort to include shrubs and climbers as well as trees, and this would have made the work more complete, but the number of trees alone which are indigenous or have run wild in Travancore is so large that if I had attempted to describe as well the numerous shrubs and climbers found here the book would have been much larger than it is, and I should probably not have been able to complete it. I have therefore contented myself with describing all the trees above 20 feet in height that occur in Travancore, mentioning the more important climbers in their proper places.

Soon after I came to the country, over 37 years ago, I began to take up the study of the trees of the Forests, but I met with the greatest difficulty in identifying them and learning anything about them. The only books on Indian trees then to be had were Dr. Balfour's *Timber Trees*, Col. Drury's *Useful Plants of India*, and Col. Beddome's *Flora Sylvatica of Madras*. The illustrations in the latter were a great help, but it was not easy to procure flowers and fruit of every tree met with, and the progress made in the identification was exceedingly slow. Since that time there have appeared the *Flora of British India* by Sir Joseph Hooker and other Botanists, Sir D. Brandis' *Forest Flora of North West and Central India*, Dr. Trimen and Sir J. Hooker's *Flora of Ceylon*, Mr. W. A. Talbot's *List of the trees, shrubs and woody climbers of the Bombay Presidency*, Mr. J. Cameron's *Forest Trees of Mysore and Coorg*, Mr. J. S. Gamble's *Manual of Indian Timbers*, the *Forest Flora of the School Circle, N. W. P.* by Rai Sahib Upendranath Kanjilal, and lastly, Sir D. Brandis' *Indian Trees*, but some of these books deal with other parts of India or Ceylon, while others describe the Flora of the Madras Presidency or of the whole of this vast continent, and it is necessary to read descriptions of a large number of trees which do not occur in Travancore in order to identify one which is found here. Moreover, most of these books are expensive aud quite beyond the means of a Ranger or Forester, hence it seemed absolutely necessary to write a book on the trees of Travancore, if our officers were ever to learn any thing about those which they saw around them.

And here I must offer my grateful thanks to His Highness the Maha Rajah for the pecuniary help given to me towards obtaining specimens to form a Herbarium and a Collection of wood-samples. It will be readily understood that the collecting and drying of many thousands of specimens of plants, mounting them and sending them to Europe and other parts of India for identification, and the cutting and conveyance of logs of wood from the interior forests cost a good deal of money, and without the timely and liberal assistance of His

G.P.T.1994. 300. 20-12-1108.

Highness I should not have been able to attempt more than a collection of Herbarium specimens of some of the trees ; and should have had to abandon the idea of collecting and testing the timbers.

Travancore with which I deal is a country of wide differences of rainfall, of elevation, and of temperature. In the extreme south, near Cape Comorin, as well as in the Shencotta taluk, and in the extreme north-east where Travancore passes over to the eastern face of the Ghats, the rainfall is very light, being from 10 to 30 inches per annum. Along the sea coast, the fall increases from about 50 to 130 inches, and it gradually rises towards the interior and culminates at the higher elevations in a downpour of 300 inches per annum. The elevation varies from sea-level to nearly 9000 feet, Aneimudi in the north-east being the highest peak (8837 ft.) and the ridge of the Ghats running from north to south at an elevation of 4000-5000 ft. or more. In the hotter parts of Travancore, the temperature in the dry weather rises well above 100° F., while on the High Range it falls in winter to 15°. With such variations it is not surprising that the number of trees to be found in the country is extraordinarily large for the area. Including the bamboos, I have enumerated 582 species, but I have several specimens not yet identified, and when the Flora has been exhaustively studied the number will probably much exceed 600.

At one time, no doubt, the greater part of the country was covered with dense evergreen forest while open deciduous forest clothed the ridges and drier parts, but a great portion of these forests has now been cleared, and they only remain untouched in the more remote and less accessible valleys. The number of trees per acre above 12 inches girth as shown by a recent valuation survey is

146 in the dense evergreen forest at high elevations,
109 in the dense evergreen forest at low elevations,
79 in the open evergreen forest at low elevations,
30 in the deciduous forest.

Owing to the geographical position of the country, the Flora of Travancore combines that of Malabar and Ceylon, but it also includes many species of wide distribution, while on the other hand there are not a few which are peculiar to the State itself or are found only in the southernmost part of the Peninsula, *i. e.* Travancore and Tinnevelly. The number of these endemic species will probably be largely augmented by new discoveries. An interesting fact which I have referred to elsewhere (Malabar Quarterly Review) is that we have many species which greatly resemble but are yet different from species found in the Malaya Peninsula which has a very similar climate. It is probable that at one time a continuous stretch of forest extended all over India connecting these two distant regions, and that the parents of these similar species flourished somewhere in the area between them.

A book of this kind is to a large extent a compilation of the observations of others, for it aims at collecting together all that is known about the species described and adding to it any further information obtained by the writer. If I had set down only what I had myself seen, the number of trees would have been smaller and the

information about each of them more meagre. I have throughout followed the arrangement of the Flora of British India except in a few places, as in the *Urticaceæ*, where I have adopted the classification given by Sir D. Brandis in his *Indian Trees.* The descriptions of the trees themselves have been taken chiefly from the *Flora of British India*, Trimen's *Flora of Ceylon*, and Brandis' *Indian Trees*, while the description of the timber have been borrowed from Gamble's *Manual of Indian Timbers* in those cases where I have not myself examined any samples. I have referred to the above works and to Beddome's *Flora Sylvatica* under each species. When I first began to write this book *Indian Trees* had not appeared, and my earlier references are to the *Forest Flora of the N. W. Provinces* by the same author, but Sir D. Brandis having very generously supplied me with an advance copy of the first half of his *Indian Trees* I from that time forward referred to his later work. The information given about each species includes (1) the vernacular names in use, (2) a brief botanical description of the tree, (3) its distribution and general appearance, (4) the time of flowering and fruiting, (5) a description of the wood, (6) its weight and the value of P, (7) information about its rate of growth and reproduction, and finally, (8) its uses and the value of the timber, where this information is obtainable.

My first step in identifying any species was to obtain its flowers and fruit. This is by no means an easy matter when the tree grows in the interior forest and probably can only be visited in the dry weather, and it has often happened that I have obtained the flowers of a tree again and again, but have never been able to secure the fruit. The collection of specimens was rendered very difficult in the case of monœcious and even more of diœcious flowers, in which the sexes are borne on different trees. In such cases the male flowers, which generally appear sooner and continue to be thrown out for a longer time than the female, were usually obtained, while the female flowers defied detection. In some cases I have had to wait more than 20 years before I could get complete specimens of both sexes of some trees. The same remarks apply to the fruit. When at last the flowers had been obtained they had to be sent for identification to some Herbarium, for though it is fairly easy to trace a flower down to the genus to which it belongs its identification, as a species, can only be satisfactorily determined by comparing it with named specimens in a Herbarium. I at first sent my collections to the late Mr. M. A. Lawson, Government Botanist at Ootacamund ; at a later date they were forwarded to Kew and to the Calcutta Herbarium, where Dr. Staff in the former institution and Col. Prain, F. R. S., (now Keeper of the Herbarium at Kew) at the latter, were good enough to examine what I sent them ; more recently my specimens were submitted to Sir D. Brandis, F. R. S., and Mr J. S. Gamble, F. R. S. To all these gentlemen I am much indebted for

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Note:—The value of P, the coefficient of transverse strength, is the result obtained by the formula $P = W \times L / B \times D^2$ where W is the weight in pounds which when placed on the middle of the bar cause it to break : L is the length of the bar between supports in feet, B and D its breadth and depth in inches (Gamble Man. Tim. XX.).

their assistance in examining my specimens and identifying them. I may add that, while on furlough in 1901, I settled in the neighbourhood of Kew and spent at the Herbarium a good portion of every day during 2 or 3 months in comparing my specimens with those stored there.

The species having been determined, the next thing was to cut down trees and collect samples of the woods large enough to yield battens for testing. These samples were all cut under my direct supervision, and they had often to be carried on coolies' heads for long distances from the interior forests. They had then to be sawn up and dried, and their strength was tested at different ages, but the values of W and P, as here given, are all those of samples dried for over six months. At first the size of the battens used in testing was 22 inches between the supports, 1 inch broad and 1 inch deep, but subsequently they were cut 2 ft. 3 inches long, so as to leave a clear 2 ft. between the supports. This size is smaller than I could have wished, but it was quite out of the question to obtain larger samples on account of the difficulties of carriage. One very interesting result of this testing of samples of wood was that I proved very conclusively that dried timber is stronger than green. In a letter written at the time to the Indian Forester I said :—"In 91 per cent. of the species " tried, the value of P increased during seasoning, and in 9 per cent " " its value either remained unaltered or declined. In several in- " " stances this decline was due to the boring of the wood by beetles, " " or to the wood itself perishing, but, as a rule, all the better kinds " " of timber greatly improved by keeping. The average improvement " " of all the species which increased in strength was 43 per cent. the " " decline of those that deteriorated averaged 8 per cent. and the " " average general improvement was 38·4 per cent. a very remarka- " " ble result considering that it was the outcome of only 6 months' " " seasoning." (Indian Forester, xxii- 81). A writer in "Forestry and Irrigation" for November 1906 states that unseasoned Red Spruce increases 400 per cent. by a thorough drying at the temperature of boiling water, while air-dried wood containing 12 per cent. moisture is from 1·7 to 2·4 times as strong as the same wood when green. This fact is opposed to the belief prevalent among the people. They pin their faith to unseasoned timber and believe that it loses strength in drying. This belief is probably due to the fact that seasoned timber, while sustaining a heavier weight than green, will break with less warning, and in the absence of any exact experiments, it was supposed that the weight sustained was therefore less. The superiority of seasoned timber has been proved by other observers, and it has also been shewn that if dried timber is wetted again or absorbs moisture, it loses some of its strength. While on this subject I must utter a word of warning against loading beams in house or bridge-construction with weights too near their maximum capability. A writer in the *Scientific American*, vol. xcvi, page 173, for 23rd February 1907 says : "It has "been well established that a wooden beam which for a short period " " will sustain safely a certain load may break eventually if the " "load remains. For instance wooden beams have been known to" "break after fifteen months under a constant load of 60 per cent" "of that required to break them in an ordinary short test."

While the heavier and harder woods increase in strength with seasoning and lose less in weight, it is the lighter woods, paradoxical as it may seem, that lose most in drying, the loss in six months amounting to 36 per cent in some of the specimens which I weighed. The explanation is not far to seek for the lighter woods are more porous, a very large amount of moisture being contained in their pores, and this moisture evaporates with drying. The value of P noted against any given timber is not always constant, for even between battens cut out of the same piece of wood and tested at the same time, there is often a great difference, but these values serve a useful purpose in shewing the comparative strength of timbers. There is much less difference in the weights of samples of the same species, though the wood of younger trees is lighter and that of older trees heavier than the average. Altogether, I tested about 250 samples of timber but this number includes a few species which were examined twice.

As examples of hardness I have selected the following species:—

Extremely soft	...	*Cochlosperum Gossypium*.
Very soft	...	*Bombax malabaricum.*
Soft	..	*Albizzia stipulata.*
Moderately hard	...	*Tectona grandis.*
Hard	...	*Hopea parviflora.*
Very hard	...	*Dalbergia latifolia.*
Extremely hard	...	*Schleichera trijuga.*

The timber of any species of tree may be recognised by one or more of the following characters.

(1) The presence or absence of *Annual rings*.
(2) The size and character of the *Medullary rays*.
(3) The size and arrangements of the *Pores*.
(4) The presence or not of a distinct *Heartwood*.
(5) The occurrence of *Partial zones* forming false rings.

(6) *Colour*, (7) *Weight*, (8) *Hardness*, (9) *Odour* and (10) *Strength* and, in the case of coniferous trees, the presence of *resin-ducts*.

Annual rings which are so often seen in cold climates are uncommon with us, but they are very noticeable in Teak-wood. They are generally marked by a belt of large pores in the spring-wood, the pores gradually diminishing in size towards the autumn-wood.

Medullary rays, or, as I have called them, simply *rays* for brevity, are narrow vertical plates of varying depths, running in radial lines and of a different kind of tissue to that which they traverse. In young saplings they may extend from the pith to the circumference, but in older trees they appear on a horizontal section as lines of varying lengths beginning and ending rather haphazard. They occur in all woods, but in some are so extremely fine as to be invisible except with a strong magnifying glass. In certain species the rays are not uniform but are of different sizes. When examined under a powerful

microscope these rays are seen to consist of a number of tubes placed one above the other and running horizontally. Their effect is to strengthen the wood by binding it together. The rays give the peculiar grain to certain woods.

Pores appear as holes or pits on a horizantal section and as grooves on a vertical section. They are generally too small to be seen with the naked eye, but in Cottonwood and other timbers they are easily visible. They vary in size not only in different woods but in the same wood, and they are scattered about or arranged in groups or in radial, oblique or concentric lines.

Heartwood appears as almost a different wood in some species of trees, as the Ebony, Blackwood and Red wood, the sapwood being generally white, but most trees have no distinct heartwood.

Partial zones are to be seen in all the species of Fig and in *Pongamia glabra.* They appear as white lines running concentrically, and between the annual rings, if there are any.

Resin-ducts are only seen in coniferous trees of which as will be seen we have only a single representative. The other characters of timber are simple and need no explanation.

Although certain peculiar characters are common to some Orders and genera it generally happens that there are exceptions to the otherwise universal rule. As examples I may mention the "pale concentric bands forming ladder-like cross-bars between the medullary rays" in most of the genera of *Anonaceæ*, and the arrangement of the pores in short radial lines in *Diospyros*, and the black or grey colour of the timber of that genus. As Mr. Gamble has pointed out "there is no regular rule for determining Orders and Genera by the wood" (*vide* Man. Ind. Timbers xvi) but local keys are easily prepared, and with the above hints anyone can draw one up for himself.

I have been at much pains during my travels to enquire, of any persons likely to know them, the vernacular names of the trees I have met with and I have collected a very large number of names. The commoner and best known trees, such as teak and Blackwood, have very few names, the same names being used throughout the country, but the less important though widely-spread species often have many names such as *Lagerstroemia lanceolata* and *Bridelia retusa*. Lastly, the less common and unimportant trees have no names except among the hill-tribes. In the Appendix to his *Manual of Indian Timbers* Mr. Gamble cautions Forest Officers against the practice of adopting the scientific names given as equivalents of vernacular words, and mentions the experience of Dr. Balfour and Drs. Wight and Arnott. There is no doubt but that vernacular names must be accepted with great caution, for mistakes may occur in several ways, (1) through the questioner or the person questioned wrongly identifying the tree, (2) through the questioner not catching the exact name, or lastly, as often happens, (3) through the person questioned giving an imaginary name rather than admit his ignorance. For this reason the identification of a tree should never be accepted on the strength of a vernacular name alone. On the other hand, it is quite

certain that we cannot do without vernacular names altogether. We must have some means of explaining what species is meant without describing it in detail, and as it is not to be expected that a Forest Guard and much less an ignorant hill-man will ever learn the scientific names of the trees met with we must fall back on their vernacular names. Every tree should have one name or perhaps two (Tamil and Malayalam) and no more, and it should be the business of all the superior officers to select the best name or names of each tree, and to make their subordinates use them and no others. The same name should not be used for more than one tree any more than one tree should have several names. With this object in view I issued a few years ago a list of the 200 commonest trees in Travancore with one Tamil and one Malayalam name for each, when I knew them. It was not pretended that the list was absolutely accurate and corrections and additions were invited.

In converting the vernacular names into English I have followed the rules for transliteration laid down by the Royal Geographical Society and given in the Proceedings of the Society for February 1892. These rules are as follows:—

(*a*) Vowels are pronounced as in Italian and consonants as in English.

(*b*) Every letter is pronounced and no redundant letters are introduced.

(*c*) One accent only is used to denote the syllable on which stress is laid.

The following rules for the pronunciation of the vowels and diphthongs may be of use:—

a	pronounced	like	u	in	"cut"
á	,,	like	a	in	"father"
e	,,	like	e	in	"hen"
é	,,	like	a	in	"fate"
i	,,	like	i	in	"tin"
ì	,,	like	i	in	"ravine"
o	,,	like	o	in	"top"
ó	,,	like	o	in	"tone"
u	,,	like	oo	in	"noon"
ú	,,	like	u	in	"flute"
ai	,,	like	i	in	"ice"
au	,,	like	ow	in	"how"
aw	,,	like	aw	in	"law"
ei	,,	like	ey	in	"they"

y is always a consonant and never terminates a word.

It is not claimed that the information given about each tree is complete or that it is in every instance absolutely correct. No one can be better aware than I am how imperfect it is and it is with the object of stimulating observation that such information as is at present available has been put together. Forest Officers may find it convenient to get their books interleaved so as to note in them anything worthy of remark opposite each tree which has been described. For convenience of reference, I have added a Glossary of

Botanical terms and a Synopsis of the Natural Orders. At first it may happen that some little difficulty will be experienced in identifying a tree from its description with the aid of the keys. To do this the enquirer must first see to which Division his specimen belongs whether to Polypetalæ, Gamopetalæ or Monochlamydeæ. If to the first named, whether to the Thalamifloræ, Discifloræ or Calycifloræ. Then by a process of elimination those Orders will be rejected which do not apply, leaving one or perhaps two or three Orders to any one of which the specimen might belong. In this way the genus and then the species may be found, though, as I have said, there may be some uncertainty about the latter without Herbarium specimens.

The Forests of Travancore are likely to increase rapidly in value in common with the appreciation of Forests all over the world. The price of timber is rapidly rising, and though substitutes may be found for it in many trades, there will always be a great demand for the better woods, while new uses will be found for what we now consider unsaleable. It is therfore the duty of every officer to endeavour to learn what he can about the Flora of his neighbourhood, which species thrive best there, and under what conditions of aspect, soil and elevation their growth is most satisfactory, which associates are most favourable to them and which retard their growth, for at any time a demand may spring up for the produce of a tree or shrub which is at present regarded as of little importance. To answer all these questions careful observations are required on the spot, and I hope that in time a large mass of information will be collected by one observer or another which will be of inestimable value. I cannot do better than quote, in conclusion, the words of that veteran Forester, the late Sir Dietrich Brandis, given in the Introduction of his last work. "The study of the sylvicultural requirements of the different" "species is the foundation of a successful system of treatment, " "leading up to the greatest annual production of timber and other" "forest produce per acre. Foresters in India should always bear in" "mind that botany is not forestry, but that the knowledge of species" "is indispensable."

T. F. BOURDILLON.

Quilon,
15th April 1908.

Glossary of Botanical Terms.

Accrescent, growing larger after flowering.

Achene, a dry, one-seeded, indehiscent fruit, or a one-seeded carpel of a dry fruit.

Acicular, needle-shaped.

Aculei, prickles *Aculeate*, prickly.

Acumen, a long tapering point. *Acuminate*, ending in a tapering point.

Acute, ending in a sharp angle, but without a tapering point.

Adnate, united to anything by its whole surface.

Adventitious, appearing in an unusual position.

Aerial roots, the roots thrown out above ground by plants e. g. the 'drops' of fig-trees.

Aestivation, the manner in which the parts of a flower are folded before it opens.

Albumen, the nutritive substance found in some seeds in addition to the embryo, see *Endosperm*. *Albuminous*, furnished with albumen.

Alburnum, the sapwood of trees.

Ament, a deciduous spike of unisexual, apetalous flowers.

Amplexicaul, embracing as when a leaf clasps a stem with its base

Androgynous, said of an inflorescence consisting of both male and female flowers.

Angiosperms, plants having the ovules fertilised through the medium of a stigma.

Annular, having the form of a ring.

Annulate, surrounded by raised rings or bands.

Anther, that portion of a stamen which contains the pollen in its cells

Anthocarp, a solid mass of flowers and fruit blended together.

Apetalous, without petals, also used for plants without calyx or corolla.

Apiculate,, ending abruptly in a little point.

Apocarpous, having the carpels free and separate.

Aril, Arillus, an accessory seed-covering rising up from the placenta *Arillate*, having an aril.

Arillode, a false aril.

Arista, and awn or bristle. *Aristate*, terminating in an awn.

Auricle, an ear-like appendage. *Auricled*, *Auriculate*, having a pair of small round lobes or ears.

Note:— This Glossary is taken from Oliver's *First Book of Indian Botany*, Lindley's *Treasury of Botany*, Beddome's *Flora Sylvatica* and Kanjilal's *Forest Flora of N. W. P.*

Awn, a beard of corn or bristle.

Axil, the angle formed between the axis and any organ that grows from it. *Axillary* in or relating to the axis.

Baccate, pulpy like a berry.

Basifixed, attached by its base.

Basilar, seated at the base.

Bast the fibrous inner bark of plants.

Berry, a succulent seed-vessel filled with pulp in which the seeds nestle.

Bi, in composition, two, as *Bifid*, divided into two segments *Bipinnate*, twice pinnate, and *Bisexual* containing both sexes in the same flower.

Blade, the flattened part of a leaf, attached to the petiole.

Bract, a modified leaf growing just beneath a flower or an inflorescence. *Bracteate*, bearing bracts.

Bracteole, a secondary bract growing beneath each flower of an inflorescence. *Bracteolate*, bearing bracteoles.

Burr, a globose prickly excrescence.

Caducous, applied to organs of a flower falling early, at or before the time of expansion.

Caespitose, growing in tufts.

Callus, a hardened part, such as the new tissue which forms over the wounds of plants.

Calyptra, a cap or hood, *Calyptrate*, covered with a cap.

Calyx, the outer whorl of floral leaves immediately outside the corolla when present. *Calcyine*, belonging to the calyx.

Cambium, a zone of tender thin-walled cells separating the wood from the bark in Dicotyledons.

Campanulate, bell-shaped.

Capitate, having a globose head.

Capitulum, a close head of sessile flower. *Capitulate*, bearing such a head.

Capsule, any dry dehiscent seed vessel.

Carina, a keel (of a papilionaceous corolla). *Carinate* keeled.

Carpel, one of the rolled up leaves composing the pistil; in maturity forming a section of the fruit.

Carpophyll, a modified leaf bearing the fruit, as in *Cycadaceae*.

Caryopsis, the grain or fruit of grasses.

Catkin, see *Ament*.

Cauda, a tail. *Caudate*, furnished with a tail.

Cells, cavities in the interior of plants, especially segments of an ovary.

Ciliate, fringed with marginal hairs.

Circinate, bent like the head of a crozier as the young fronds of a *Fern*.

Circumscise, cut circularly round the sides.

Cirrhus, a tendril. *Cirrhose*, bearing tendrils.

Clavate, club-shaped, gradually thickening upwards from a slender base.

Clawed, having a long narrow base.

Coccus, pl. **Cocci,** a one-seeded carpel of a syncarpous fruit which separates itself with elasticity from the axis of the fruit.

Cochleate, twisted in a short spiral.

Coma, a tuft of soft hairs at the end of some seeds. *Comose*, having a coma.

Cone, the conical arrangement of scales in the fruit of a *Fir* or *Casuarina*.

Confluent, gradually uniting together,

Connate, when any parts originally distinct become united together.

Connective, the portion of an anther which connects the two cells together.

Connivent, **conniving,** converging to form an arch.

Contorted, an arrangement of petals or corolline lobes when each piece overlaps its neighbour by one margin, but is overlapped on the other.

Convolute, when one part is rolled up in another,

Cordate, heart-shaped.

Coriaceous, leathery and tough.

Corolla, the inner whorl of floral leaves between the calyx and the stamens.

Corona, a crown-shaped process intervening between the petals and the stamens.

Corymb, a raceme whose pedicels are gradually shorter as they approach the summit so that it forms a flat-topped inflorescence *Corybmose*, *corymbiform*, bearing corymbs.

Costa, the mid-rib of a leaf.

Cotyledons, the seed-lobes.

Crenate, having rounded flat teeth.

Crenulate, with small rounded teeth.

Crustaceous, hard thin, and brittle,

Cucullate, hooded.

Culm, the hollow stem of bamboos and grasses.

Cuneate, wedge-shaped.

Cupular, cup -shaped, slightly concave.

Cusp, a tapering, rigid point, *Cuspidate*, ending in a long rigid point,

Cyme, a centrifugal panicle in which the central flower opens first and the lateral flowers later.

Deciduous, finally falling off, often used of trees which lose all their leaves together.

Declinate, inclined to one side or bent down.

Decompound, having various compound divisions.

Decurrent, running down below the point of insertion.

Decussate, with opposite pairs alternating at right angles.

Definite, said of stamens when less than 20 in number; said of an inflorescence in which the axis terminates in a flower, with other flowers arranged round it.

Dehiscence. the act of splitting to discharge the contents of a fruit.

Dentate, having sharp teeth with concave edges.

Denticulate, finely-toothed.

Di, in composition two.

Diadelphous, containing two bundles of stamens, united by their filaments.

Diandrous, bearing two stamens.

Dichotomous, with the divisions in pairs.

Diclinous, having the stamens in one flower and the pistil in another, unisexual.

Didymous, double or two-lobed.

Didynamous. having two long and two short stamens.

Digitate, when several distinct leaflets radiate from the point of a leaf-stalk.

Dimorphic, Dimorphous, having two forms.

Dioecious, unisexual, with the male and female flowers borne on different plants.

Disk, an organ intervening between the stamens and ovary and generally taking the form of a ring or scales.

Discoid, Disciform, circular and flat like a quoit.

Dissepiment, a partition in a fruit caused by the adhesion of the sides of carpellary leaves.

Distal, the end-leaflet in a trifoliolate leaf.

Distichous, arranged in two opposite, vertical rows.

Divaricate, wide-spreading.

Drupe, a fleshy fruit with a bony putamen or stone.

Drupaceous, having a fleshy stone-fruit.

Duramen, the hard inner wood of trees.

Ebracteate, having no bracts.

Echinate, furnished with prickles.

Emarginate, having a notch at the end.

Embryo, the rudimentary plant formed in a seed.

Endemic, peculiar to a certain place and found only there.

Endocarp, the inner surface of a pericarp.

Endosperm, the albumen formed inside the embryo-sac.

Entire, of leaves having no kind of marginal division or indentation.

Epigynous, inserted on the ovary.

Epipetaleus, inserted on the petals.

Epiphyte, plants growing upon others but not nourished by them. *Epiphytes*, having the habits of epiphytes.

Equable, uniform, seid of the enlosperm of some seeds.
Equally pinnate, pinnate without an odd terminal leaflet.
Ex, a prefix meaning without or outside.
Exalbuminous, without albumen.
Exserted, projecting beyond the corolla.
Exstipulate, without stipules.
Exocarp, the exterior surface of the pericarp.
Extrorse, dehiscing outwards from the axis like some anthers.
Falcate, curved like a sickle.
Fascicle, a cluster or bunch, *Fascicled*, *fasciculate*, clustered.
Fastigiate, tapering to a point, pyramidal.
Filament, the stalk of an anther.
Filiform, slender like a thread.
Fimbriate. fringed with long slender processes.
Floccose, covered with soft woolly hairs.
Follicle, a fruit of a single carpel dehiscing by the ventral suture only.
Frond, the leaf of a fern.
Fusiform, spindle-shaped, tapering to both ends.
Fulvous, dull yellow.
Gamo, in compound means united by the edges, as *Gamopetalous* with petals united, *Gamophyllous*, with segments of the perianth united, and *Gamosepalous*, with united sepals.
Gibbous, with a short obtuse spur.
Glabrous, **Glabrate**, smooth without hairs.
Glabrescent, somewhat glabrous.
Glands, wart-like swellings found on the surfaces of plants; they are extremely various in form and often contain oil. *Glandular*, having glands.
Glaucescent, dull green passing into greyish-blue.
Glaucous, bluish-green often covered with a fine bloom.
Globose, spherical.
Glumes, the exterior series of the scales which constitute the flower of grasses. *Glumaceous*, resembling glumes.
Gymnosperms, plants with naked seeds, *i. e.*, not enclosed in an ovary.
Gynophore, the stalk of an ovary.
Hastate, when a leaf is pointed and the lobes at its base are diverted horizontally.
Haustorium, pl. **haustoria**, a sucker by means of which the roots of some plants feed on others.
Heartwood, (or duramen) the central part of the timber of exogens, hardened by age.
Hermaphrodite, containing both stamens and pistil in the same flower.

Hirsute, with rather long stiff hairs.

Hispid, covered with short harsh hairs.

Hypocarp, the thickened peduncle resembling a fruit below the nut of *Semecarpus* and *Anacardium*.

Hypocrateriform, having a long slender tube and a flat limb.

Hypogynus, inserted below the ovary.

Imbricate, overlapping like tiles on a roof.

Impari-pinnate, odd-pinnate, pinnate with an odd leaflet.

Indefinite, numerous, more than 20; said of an inflorescence when the axis does not terminate in a flower but gives off a succession of flowers on lateral pedicels.

Indehiscent, of fruit not splitting spontaneously but falling off with the seeds.

Induplicate-valvate, having the margins bent abruptly inwards and touching each other without overlapping

Inferier, inserted below ovary and free from it, if said of the calyx; adnate to or situated below the calyx, if said of the ovary.

Inflorescence, the manner in which flowers are arranged on a plant.

Infrafoliar, inserted below the leaves.

Infrastipular, inserted below the stipules.

Interfoliar, inserted within leaves.

Internode, the space between two nodes.

Interpetiolar, said of stipules inserted between the petioles of opposite leaves, as in *Rubiaceae*.

Introrse, applied to anthers dehiscing inwards.

Irregular, not symmetrical, when the parts of a corolla or perianath are of different sizes and shapes.

Keel, (or carina) the central dorsal ridge like the keel of a boat in the corolla of a *Papilionaceons* flower.

Lacerate, irregularly divided by deep incisions.

Laciniate, slashed with deep and narrow incisions.

Lanceolate, lance-headed, narrow and tapering to both ends, 2-4 times, as long as broad.

Legume, a pod, a solitary carpel usually two-valved and bearing its seeds on the ventral suture only.

Lenticel, a lentil-shaped gland or corky excrescence appearing on the stems of many trees. *Lenticellate*, having lenticels.

Lenticular, lens-shaped, like a double convex lens.

Lepidote, scurfy, covered with minute scales.

Liber, the inner bark of plants formed of bast-cells.

Ligule, a strap or anything narrow with paralleled sides, such as the limb of the florets of some *Compositae*, and the thin projection from the sheaths of some grasses.

Limb, the flat expanded part of a petal or of a flower.

Linear, very narrow and long, at least 5 times as long as broad.

Lobate, lobed. *Lobulate*, divided into small lobes.

Lodicule, a hypogynous scale in the flowers of some grasses.

Marcescent, of flowers persisting when withered and dry.

Medullary rays, the cellular plates in timber which radiate outwards towards the cambiun. See Introduction.

Mitræform, shaped like a mitre, conical.

Mono, in composition, one.

Monadelphous, having all the stamens united by their filaments into a tube

Monandrous, having one stamen.

Monocarpic, monocarpous, producing fruit only once in its life and then dying.

Monœcious, unisexual, with the male and female flowers, on the same plant.

Mucronate, abruptly terminated by a hard sharp point.

Muticous, without any point.

Nerves, the ribs or principal-veins of a leaf. *Nervation*, the arrangement of nerves. *Nervose*, with the nerves strongly developed.

Node, the part of a stem from which a leaf arises, generally used for the divisions in the stems of grasses.

Nut, a hard indehiscent one-seeded fruit.

Ob, as a perfix means inverted, as *obconical* inversely conical, the narrow apex turned to the base; *obcordate*, inversely cordate ; *oblanceolate*, inversely lanceolate: and *obovate*, inversely ovate.

Oblong, longer than broad with the sides parallel.

Odd-pinnate , unequally pinnate, imparipinnate.

Operculum, a lid. *Operculate*, covered with a lid.

Orbicular, flat and circular.

Ovary, that part of the pistil which contains the ovules.

Ovate, flat and egg shaped in outline with both ends rounded and the broadest part below the middle.

Ovoid, an egg-shaped solid.

Ovule, the young seed.

Palea, the innermost glume in the flowers of grasses, and the chaffy scales on the receptacles of some *Compositæ*. *Paleaceous*, chaff-like.

Palmate, having the mid-ribs of the lobes of a leaf radiating from a common stalk.

Palmatilobed, palmately divided.

Palmatisect, cut nearly to the base in a palmate manner.

Palminerved, with nerves radiating like the ribs of a palmate leaf.

Panicle, an inflorescence in which the axis is divided into branches bearing many flowers, a compound raceme. *Paniculate* like a panicle.

Papilionaceous, like a butterfly. A large section of the *Leguminosae* are called *Papilionaceae*.

Papillose, covered with minute soft excrescences.

Pappus, the scales or hairs attached to the seeds of many *Compositae* representing the limb of the calyx.

Parenchyma, cellular tissue which has a spheroidal not tubular form. All the young parts of plants are formed of it.

Parietal, attached to the inner wall of an ovary.

Pedicel, the stalk of a single flower in an inflorescence or cluster of flowers. *Pedicellate*, having a pedicel.

Peduncle, the stalk of a solitary flower or fruit, or of a cluster of flowers or fruits. *Pedunculate*, stalked.

Peltate, attached to the stalk by the centre of the leaf or by some point other than the margin.

Penninerved, Penniveined, having ribs or veins running regularly from the mid-rib to both margins of a leaf.

Perianth, the calyx and corolla combined when thy look so similar as not to be distinguishable.

Pericarp, the shell or outer portion of a fruit outside the seeds.

Perigynous, inserted round the ovary.

Persistent, not falling off but remaining attached.

Petal, a division of the corolla when these divisions are not united to each other. *Petaloid*, having petals,

Petiole, the stalk of a leaf. *Petiolate*, having a petiole.

Petiolule, the stalk of a leaflet. *Petiolulate*, having a petiolule.

Phyllode, a flat petiole with no blade.

Pilose, covered with soft loose hairs.

Pinna, pinnae, the primary divisions of a bipinnate or tripinnate leaf. *Pinnate*, a compound leaf with the leaflets arranged on each side of the rachis.

Pinnatifid, divided almost to the axis into lateral segments.

Pinnatisect, divided down to the axis into separate segments.

Pinnule, the secondary divisions of pinnate leaves.

Pisiform, shaped like a pea.

Pistil, the female part of a flower consisting of ovary, style, stigma and ovules,

Placenta, that part of the ovary on which the ovules originate.

Plumose, feathery.

Pod, the dry seed-case of leguminous and cruciferous plant.

Pollen, the minute grains contained in the cells of an anther which fertilise the ovary.

Poly, in composition, many.

Polyadelphous, having many bundles of stamens united by their filaments.

Polycarpic, Polycarpous capable of bearing fruit many times before dying.

Polygamous, having both hermaphrodite and unisexual flowers on the same or different plants.

Pome, a fleshy many-celled fruit.

Pore, a hole, either in wood or in the anthers of some flowers.
Præmorse, with the end irregularly ragged, as if bitten off.
Prickles, sharply pointed projections originating from the bark.
Prophylla, modified leaves as in *Cycas*.
Pruinose, covered with a granular secretion or bloom, as on the fruit of some plants.
Pubescent, downy, with very short, soft hairs.
Puberulous, covered with very fine pubescence.
Pulvinus, a cushion-like enlargement at the base of some leaves.
Pulvinate, provided with a cushion.
Punctate dotted, marked with some colour arranged in some dots.
Putamen, the hard bony lining of stone-fruits.
Pyrene, one of the stones of a drupaceous fruit when there are several.
Pyriform, pear-shaped.
Raceme, an inflorescence in which the flowers are arranged singly on distinct pedicels along a common axis.
Rachis, the principal axis of a pinnate leaf or of an inflorescence.
Radicle. the first root of a plant, rudimentary in the embryo.
Ray, same as a medullary ray, which see; also part of the flower-head of one of the *Compositae*.
Receptacle, the top of the flowering branch from which the flower leaves spring. Also the so called fruit of figs.
Reflexed, strongly curved backwards.
Regular, symmetrical, when all the petals or the perianth-lobes are of the same size and shape.
Reniform, kidney-shaped.
Resupinate, applied to flowers when upside down.
Reticulate, having the appearance of network.
Retuse, applied to an obtuse extremity notched in the middle.
Revolute, with the margins rolled outwards.
Rhizome, a prostrate rooting stem, progressively throwing up leaves.
Rhomboid, rhomboidal. lozenge-shaped with the sides equal and parallel but not all the angles equal.
Rotate, wheel-shaped, applied to a gamopetalous corolla with a spreading limb equalling or exceeding the tube.
Rugose, wrinkled.
Ruminated, mottled, streaked with colored lines like the albumen of a nutmeg.
Saccate, provided with a bag.
Sagittate, arrow-headed, with a pointed apex and the base extended downwards into two sharp, acute lobes.
Samara, an indehiscent dry fruit expanded into a wing at one end *Samaroid*, having a samara.
Sapwood, the albumen or outer younger layers of wood.
Scabrid, scabrous, rough to the touch.
Scaberulous, somewhat scabrid.

Scale, a modified leaf or other reduced organ, whether in the leaves or flowers.

Scape, a long leafless peduncle springing from the root and bearing one or many flowers.

Scarious, dry and stiffly membranous.

Scorpioid, used of an inflorescence which is rolled up towards one side like a crozier, unrolling as the flowers expand,

Secund, having all the flowers or leaves turned to one side.

Sepal, one division of the calyx when it is not combined.

Septum, a portion of a fruit or of anything. *Septate*, divided.

Sericeous, covered with silky appressed hairs.

Serrate, having sharp straight-edged teeth directed forward like those of a saw.

Serrulate, minutely serrate.

Sessile, seated on the body which supports it, without any stalk.

Setaceous, bristle-like.

Simple, of leaves not divided into separate leaflets.

Sinuate, wavy.

Sinus, the space between lobes or segments.

Spadix, a flower-spike bearing numerous flowers and enclosed in a spathe.

Spathe, a sheathing bract-leaf enclosing a spadix. *Spathaceous*, spathelike.

Spathulate, shaped like a spatula; broad and rounded at the apex with the lower and much attenuated.

Spike, an inflorescence, with the flowers sessile on a long axis. *Spicate*, *Spiciform*, arranged in spikes.

Spikelet, a secondary spike: the small terminal collection of florets in grasses.

Spine, a sharply-pointed projection originating from the wood and regarded as an abortive branch or leaf, *Spinescent*, *spinous*, covered with spines.

Stamen, the male organ of a flower consisting of a filament and an anther.

Staminode, an abortive stamen.

Standard, the posterior or odd petal of a *Papilionaceous* corolla.

Stellate, having a number of divisions arranged like the rays of a star.

Stigma, that surface of the style to which the pollen adheres when it fertilises the ovary. *Stigmatic*, belonging to the stigma.

Stipe, a stalk. *Stipitate*, stalked.

Stipules, processes of various kinds often springing from the base of a leaf. *Stipulate*, having stipules.

Stipel, a secondary stipule attached to a leaflet. *Stipellate*, having stipels.

Stone, see *Putamen*.

Striate, streaked or marked with fine lines.

Strigose, covered with sharp close-pressed rigid hairs.

Style, the tubular stalk supporting the stigma.

Sub. in composition means somewhat or nearly, as *Subglobose*, somewhat globose.

Subsessile, nearly sessile.

Subulate, shaped like an awl, tapering to a fine point from a broad base.

Sulcate, furrowed.

Superior, growing above. The calyx may be superior to the ovary, or the ovary to the calyx.

Suture, the seam or line of junction of two parts.

Syncarpous, said of a pistil consisting of two or more carpels cohering together.

Syncarpium, a fruit consisting of many carpels consolidated and adhering to a central receptacle.

Terete, cylindrical with the transverse section circular.

Terminal, terminating a stem or branch.

Testa, the tough outer coat of a seed.

Tetra, in composition means four, as *tetramerous*, having the parts in four: *tetrandrous*, having four stamens.

Thalamus. the floral receptacle or that part of the axis of a flower which supports the pistil.

Tomentum, a short dense cottony down. *Tomentose* covered with down.

Torulose, a cylindrical body with contractions at regular intervals.

Torus, the thalamus or floral receptacle.

Tri, in composition, three.

Trichotomous, having the divisions always in threes.

Trifoliate, **Trifoliolate**, with three leaflets.

Trigonous, three-cornered in cross section with the angles obtuse.

Trimerous, applied to flowers with the parts in threes.

Tripinnate, when the leaflets of a bipinnate leaf become themselves pinnate.

Triplinerved, with a strong secondary nerve on each side of the mid-rib and all proceeding from the base of the leaf.

Triquetrous, three-cornered in cross section with the angles acute.

Truncate, terminating abruptly as if cut off straight.

Tube, the lower united portion of a calyx or corolla.

Tubercle, a small warty excrescence, *Tubercled*, covered with tubercles.

Tumid. swollen.

Turbinate, top-shaped.

Umbel, a form of inflorescence in which all the pedicels start from the same point and are of the same length.

Undulate, with a wavy margin.

Unequally pinnate, odd-pinnate with an odd leaflet.

Unisexual, diclinous, of flowers containing only male or female organs.

Urceolate, urn-shaped.

Valvate, when the sepals or calyx-segments or the petals or corolla-lobes simply touch without overlapping.

Veins, the nerves of a leaf.

Venation, the arrangement of the veins in the blade of a leaf.

Ventral, belonging to the anterior surface of anything, as the inner surface of a carpel.

Ventricose inflated, swelling unequally on one side.

Vernation, the manner in which leaves are arranged within the leaf-bud.

Verrucose, tubercled, covered with warts.

Versatile, swinging freely as the anthers of certain plants and grasses.

Vertical a whorl ; *verticillate*. arranged in a whorl or whorls.

Villous, shaggy, covered with long weak hairs.

Whorl, a ring of organs arranged in the same plane round an axis

Wing, any thin, membranous appendage.

Wings, the side-petals in a *Papilionaceous* corolla.

Synopsis of the Natural Orders.

All plants are divided into the following chief divisions :—

I. PHANEROGAMS, seed-bearing plants in which fertilization is effected by means of pollen-tubes.

II. CRYPTOGAMS, spore-bearing plants in which fertilization is not effected by means of pollen-tubes.

As this book does not refer to CRYPTOGAMS which include Ferns, Mosses, Lichen and Fungi; they need not be further considered.

PHANEROGAMS are again divided into the following classes :—

i. DICOTYLEDONS (or EXOGENS) in which the embryo develops 2 seed-leaves or cotyledons. The stem consists of pith, wood, bast, and bark which form concentric cylinders, and growth proceeds by the addition of external layers to the wood. The leaves are net-veined.

ii. MONOCOTYLEDONS (or ENDOGENS) in which the embryo develops only one seed-leaf. The wood is in isolated bundles. The growth is from the inside, and the leaves are straight-veined.

The further divisions of these two classes may be shown in the form of a Key.

DICOTYLEDONS.

(*a*) Ovules enclosed in an ovary, and fertilized through a stigma . *Angiosperms.*

(*b*) Calyx and corolla both present . *Dichlamydeae.*

(*c*) Corolla composed of distinct petals . *Polypetalae.*

(*d*) Calyx of distinct sepals, petals hypogynous

(*e*) Thalamus small, not expanded . *Thalamiflorae.*

(e_2) Thalamus expanded into a disk . *Disciflorae.*

(d_2) Calyx of combined sepals, petals inserted on the calyx . *Calyciflorae.*

(c^2) Corolla of combined petals . *Gamopetalae.*

or . *Corolliflorae.*

or . *Corolliflorae.*

(b^2) Calyx or corolla or both absent . *Monochlamydeae.*

or . *Apetalae.*

(a^2) Ovules not enclosed in an ovary, and fertilized by direct contact with the pollen . *Gymnosperms.*

MONOCOTYLEDONS

i.	Flowers with a white or coloured perianth, solitary or in umbels or racemes. Fruit a capsule or berry . .	*Petaloideae.*
ii.	Flowers not coloured, arranged on a spadix. Fruit a berry or drupe .	*Spadiciflorae.*
iii.	Flowers glumaceous in spikelets. Fruit a caryopsis . . .	*Glumiferae.*

I. POLYPETALÆ.

Flowers generally bisexual, usually with both calyx and corolla, the corolla consisting of distinct petals.

A. THALAMIFLORAE.

Sepals generally distinct, petals and stamens hypogynous, ovary free. Stamens 15 or more except in some or all the genera in the following Orders: 3, *Anonaceae*, 4. *Berberideae*, 6. *Violaceae*. 7. *Bixineae*, 8. *Pittosporeae*, 9. *Polygáleae* and 14. *Sterculiaceae*. Thalamus generally small or elongated, not expanded.

1. **Dilleniaceæ**, p. 1. Leaves alternate and simple, petioles sheathing, Flowers 5-merous, bisexual. Sepals persistent. Stamens indefinite. Seeds often with an aril.

2. **Magnoliaceæ**, p. 2. Leaves alternate and simple, stipules convolute. Flowers 3-merous, bisexual. Stamens indefinite. Carpels numerous. Endosperm uniform.

3. **Anonaceæ**, p. 3. Leaves alternate and simple, stipules absent. Flowers bisexual. Sepals 3, sometimes connate. Petals 6 in two rows. Stamens usually indefinite. Endosperm ruminated.

4. **Berberideæ** p. 13. Leaves alternate, simple or pinnate. Flowers bisexual. Sepals and petals 6. Stamens 6. Carpels fleshy.

5. **Capparideæ**, p. 14, Leaves alternate, simple or compound stipules often present and spinescent. Flowers bisexual. Sepals and petals 4. Stamens usually indefinite. Ovary often stipitate. Seeds exalbuminous.

6. **Violaceæ**, p. 15. Leaves alternate, simple and stipulate. Flowers bisexual or polygamous. Sepals 5. Stamens 5. Seeds albuminous.

7. **Bixineæ**, p, 15. Leaves alternate, usually simple, stipules small or O. Flowers bisexual or unisexual. Sepals 4-6, Petals 4-6 or 12 or absent. Stamens 5-8 or many. Fruit indehiscent

8. **Pittosporeæ**, p. 19. Leaves alternate, simple and exstipulate. Flowers bisexual. Sepals, petals and stamens 5. Fruit capsular, Endosperm copious.

Note. Although the above are the general characters of the Natural Orders placed in each division there are exceptions, as for instance the petals are wanting in some Dichlamydeae, they are combined in some Polypetalae and so on. Full information on these points is given in the descriptions of the genera.

9. **Polygaleæ**, p. 20. Leaves alternate, simple and exstipulate Flowers irregular bisexual. Sepals 5, unequal. Petals 3 or 5, unequal. Stamens 8. Anthers opening by terminal pores. Fruit 1-seeded.

10. **Guttiferæ**, p. 21. Leaves opposite, simple and exstipulate. Sap often coloured. Flowers bisexal or polygamo-diœcious. Sepals 4-5, persistent. Petals 4-8. Stamens indefinite. Fruit usually indehiscent. Endosperm none.

11. **Ternstroemiaceæ**, p. 32. Leaves alternate, simple- exstipulate. Flowers bisexual or diœcious. Sepals and petals 5 Stamens 5-30. Fruit indehiscent or capsular.

12. **Dipterocarpeæ**, p. 34. Leaves alternate, simple and stipulate Flowers bisexual. Sepals and petals 5. Stamens 15 or many. Fruit a 1-seeded nut often winged.

13. **Malvaceæ**, p. 42. Leaves alternate, simple or digitate, with or without stipules. Flowers bisexual. Sepals and petals 5. Stamens many, monadelphous, anthers 1-celled. Fruit capsular.

14. **Sterculiaceæ**, p. 47. Leaves alternate, simple or digitate, stipulate. Flowers unisexual or bisexual. Sepals 4-7. Petals 5 or 0. Stamens 5-15, monadelphous, anthers 2-celled. Carpels distinct or united into a capsule. Seeds often winged.

15. **Tiliaceæ**, p. 55. Leaves alternate, simple or lobed, stipules caducous. Flowers bisexual. Sepals and petals 3-5. Stamens numerous, free. Seeds without an aril.

B. DISCIFLORAE.

Sepals generally distinct, petals and stamens hypogynous, ovary free. Stamens 3-10 except in some genera of 18, *Rutaceae* and 20. *Ochnaceae*. Thalamus expanded into a fleshy disk except in 25. *Ilicineae*.

16. **Lineæ**, p. 61. Leaves alternate and simple. Flowers bisexual. Sepals and petals 5. Stamens 4-10, more or less cohering below. Fruit a drupe.

17. **Geraniaceæ**, p. 62. Leaves alternate or opposite, simple or compound. Flowers bisexual, often irregular. Sepals 3 or 5, one often spurred. Petals 3 or 5 or none. Stamens 5 or 10. Fruit a capsule or drupe.

18. **Rutaceæ**, p. 62. Leaves alternate or opposite, usually compound, gland-dotted, exstipulate. Flowers unisexual or bisexual. Stamens as many or twice as many as petals (in *Citrus* and *Aegle* indefinite). Fruit a berry or dry.

19. **Simarubeæ**, p. 72. Leaves alternate. simple or pinnate. Flowers bisexual or polygamous. Sepals and petals 4 or 5, Stamens 8-10. Fruit of 1-5 distinct carpels.

20. **Ochnaceæ**. p. 74. Leaves alternate, simple, exstipulate. Flowers bisexual. Sepals and petals 5. Stamens 10 or many. Fruit-carpels distinct, 1-seeded.

21. **Burseraceæ**, p. 75. Leaves alternate and compound Flowers unisexual or polygamous. Calyx 3-6-lobed. Sepals and petals 3-5. Stamens 5-10. Fruit a 1-seeded drupe.

22. **Meliaceæ**, p. 78. Leaves alternate, compound, exstipulate. Flowers bisexual or polygamous. Calyx 3-6-lobed. Petals 3-6, Stamens 5-10, generally united into a tube. Fruit generally capsular, seeds often winged.

23. **Chailletiaceæ**, p. 93. Leaves alternate and simple, stipules persistent. Flowers polygamo-diœcious. Sepals and petals 5, Stamens 5, Fruit a 2-valved drupe.

24. **Olacineæ**, p. 94. Leaves alternate, simple, exstipulate. Flowers bisexual or polygamous. Calyx-teeth 4-6. Petals 4-6. Stamens 4-6. Fruit a drupe with a 1-seeded stone.

25. **Ilicineæ**. p. 97. Leaves alternate, simple, exstipulate. Flowers diœcious. Calyx 4-5-fid. Petals connate into a 4-5 lobed corolla. Stamens 4 or 5. No disk. Fruit a drupe.

26. **Celastraceæ**, p. 98. Leaves usually opposite, simple, with or without stipules. Flowers bisexual. Calyx-segments and petals 4-5. Stamens 3, 4 or 5, Fruit a 2-valved capsule or 1-seeded drupe.

27. **Rhamnaceæ**, p. 104. Branchlets often spinous. Leaves alternate, simple with small stipules. Flowers bisexual or unisexual Calyx segments, petals and stamens 4-5. Fruit a drupe or capsule.

28. **Ampelideæ**. p. 107. Leaves alternate, simple or compound, stipulate. Flowers bisexual. Calyx-segments and petals 4-5, stamens 4-5 opposite the petals. Disk large. Fruit a berry.

29. **Sapindaceæ**, p. 108. Leaves usually alternate, generally compound, usually without stipules. Flowers often irregular. usually polygamous or diœcious. Sepals 4- 6 petals 4-5 or 0. Stamens 5-10. Fruit capsular or indehiscent.

30. **Sabiacaæ**, p. 114. Leaves alternate. simple or pinnate, stipules none. Flowers irregular, bisexual or polygamous Calyx-segments 4-5. Petals 4-5, unequal. Stamens 5, only 2 fertile. Fruit a 1-seeded drupe.

31. **Anacardiaceæ**, p. 116. Leaves alternate, simple or compound, stipules none. Flowers unisexual or bisexual. Calyx-segments 3-5. Petals 3-6, stamens 4-10. Fruit usually a drupe.

II. CALYCIFLORÆ.

Calyx gamosepalous, often adnate to the ovary. Petals inserted on the calyx. Stamens perigynous or epigynous, less than 15 except in some genera of 33. *Leguminosae*, 34. *Rosaceae*, 35. *Rhizophoraceae*, 37. *Myrtaceae*, and 43. *Cornaceae*.

32. **Onnaraceæ**, p, 128. Leaves alternate, unifoliolate, stipules none. Flowers bisexual. Calyx-segments and petals 4-5, stamens 4-5 alternating with staminodes. Fruit a follicle enclosing one seed surrounded by a pulpy aril.

33. **Leguminosæ.** p. 129. Leaves alternate. stipulate, generally compound, with entire leaflets. Flowers usually irregular, bisexual. Calyx segments and petals 5. Stamens usually 10. Fruit a one-celled legume.

34. **Rosaceæ**, p. 163, Leaves alternate, simple or compound, stipulate. Flowers often irregular, usually bisexual. Calyx-segments and petals 4-6. Stamens 10-12 or many. Fruit fleshy or dry.

35. **Rhizophoraceæ**, p. 166. Leaves opposite and simple, stipules caducous. Flowers bisexual. Clayx-segments and petals 4-14. Stamens double the number of petals or more. Fruit usually 1-seeded.

36. **Combretaceæ**, p. 172. Leaves alternate or opposite, simple exstipulate. Flowers usually bisexual. Calyx-segments 4-5. Petals 4-5 or 0. Stamens 8 or 10. Ovary inferior, 1-celled with pendulous ovules. Fruit fleshy or dry-seeded.

37. **Myrtaceæ** p. 180. Leaves opposite or alternate, simple stipules none. Flowers bisexual. Calyx-segments and petals 4-5. Stamens numerous. Ovary inferior. Fruit fleshy or dry.

38. **Melastomaceæ**, p, 194. Leaves opposite, simple, exstipulate. Flowers bisexual, Calyx-segments and petals 4-5. Stamens twice the number of petals. Ovary wholly or half-inferior. Fruit a capsule or berry.

39. **Lythraceæ**, p. 197. Leaves opposite and simple, stipules small or none. Flowers bisxual. Calyx-segments and petals 4-6. Stamens double the number of petals or many. Ovary superior. Fruit capsular or indehiscent.

40. **Samydaceæ**, p. 200. Leaves alternate, simple, stipules very small. Flowers bisexual. Calyx-segments 4-5. Petals 4-5 or none. Stamens 4-10. Ovary superior or half-inferior. Fruit a soft capsule, seeds many, surrounded by an aril.

41. **Datiscaceæ**, p. 203. Leaves alternate, simple, exstipulate. Flowers apetalous and diœcious. Calyx-segments and stamens 4. Ovary inferior, 1-celled with numerous ovules. Fruit a capsule.

42. **Araliaceæ**, p. 204. Leaves alternate. usually compound, stipulate. Flowers bisexual. Calyx-segments very small or 0. Petals and stamens 5 or 6. Ovary inferior, 2-5-celled with 1 ovule in each cell. Fruit a berry.

43. **Cornacæ.** p. 206. Leaves alternate, simple stipules none. Flowers bisexual. Calyx-segments 4-5. Petals 4-10. Stamens 4-5 or many. Ovary inferior, 1-celled with 1 pendulous ovule. Fruit a 1-seeded drupe.

II. GAMOPETALÆ. (COROLLIFLORÆ.)

Corolla with the petals united except in some genera of 52. *Styraceae*, and 53. *Oleaceae*. Stamens fewer than 15, except in some species of 51. *Ebenaceae*, and in 52. *Styraceae*.

(*a*) Ovary inferior.

44. Caprifoliaceæ. p. 209. Leaves simple, opposite, exstipulate Flowers bisexual Calyx segments, corolla-lobes, and stamens 5 each. Fruit a 1-seeded drupe.

45. Rubiaceæ, p. 209. Leaves simple, opposite or whorled, with interpetiolar stipules. Flowers bisexual. Calyx-segments, corolla-lobes and stamens 4-9. Fruit a capsule, berry or drupe.

46. Compositæ. p. 226. Leaves simple, alternate (rarely opposite) exstipulate. Flowers bi-or unisexual packed in heads. Corolla-lobes and stamens 5. Anthers connate into a tube. Fruit a 1-seeded achene.

47. Vaccinanceæ, p. 227. Leaves alternate, simple, exstipulate. Flowers bisexual. Calyx-segments and corolla-lobes 5. Stamens 10. Anthers opening by pores. Fruit a berry.

(*b*) Ovary superior except in 52, *Styraceae*.

48. Ericaceæ, p. 229. As in *Vaccinaceae*, except that the ovary is inferior.

49. Myrsinaceæ, p. 230. Leaves alternate, simple, exstipulate. Flowers occasionally polygamous. Calyx-segments, corolla-lobes and stamens 5. Fruit a berry or follicle.

50. Sapotaceæ, p. 234. Leaves alternate, simple, exstipulate. Flowers bisexual. Calyx-segments 4-8. Corolla-lobes as many or 2-4 times as many. Stamens 5-6, 8 or 12, often with staminodes. Ovary 4-8 celled with 1 ovule in each cell. Fruit a berry.

51. Ebenaceæ, p. 241. Leaves alternate, simple, exstipulate. Flowers usually dioecious. Calyx-segments and corolla-lobes 3-7. Stamens 4-64, often unequal. Ovary 3-10 celled with 1 or 2 ovules in each cell. Fruit fleshy or hard.

52. Styraceæ, p. 255. Leaves alternate, simple, exstipulate. Flowers bisexual. Calyx-segments 4-5. Corolla-tube reduced to a ring, lobes 4-5. Stamens many. Ovary inferior or superior. Fruit a drupe 1-3-seeded.

53. Oleaceæ, p. 259. Leaves opposite, simple or compound, stipules none. Flowers usually bisexual. Calyx-segments 4 or more. Corolla-lobes 4, some times with distinct petals. Stamens 2. Ovary free, 2-celled. Fruit a drupe or berry.

54. Apocyanceæ, p. 263. Leaves opposite or whorled, simple, stipules none. Sap milky. Flowers bisexual. Calyx-segments 5 (or 4). Corolla-lobes 5 (or 4). Stamens 5. Ovary superior, usually of two distinct carpels. Fruit usually of 2 follicles.

55. Loganiaceæ, p. 269. Leaves opposite, simple, stipules interpetiolar or absent. Flowers bisexual. Calyx-segments and corolla-lobes 4 or 5. Stamens 4 or 5. Ovary 1-or 2-celled. Fruit fleshy.

56. **Boragineæ**, p. 272. Leaves alternate (or opposite), simple, exstipulate. Flowers bisexual. Calyx-segments and corolla-lobes 5-8. Stamens 5-8. alternating with corolla lobes. Ovary 2-or 4-celled. Fruit of four 1-seeded pyrenes or a drupe.

57. **Bignoniaceæ**, p. 275. Leaves opposite, compound, exstipulate. Flowers bisexual, irregular. Calyx-segments and corolla-lobes 5. Stamens usually 4. Ovary 2-celled. Fruit a 2-valved capsule with numerous winged seeds.

58. **Verbenaceæ**, p. 279. Leaves opposite or whorled, simple or compound, stipules none. Flowers bisexual, regular or irregular. Calyx-segments and corolla-lobes 4 or 5 or 2 lipped. Stamens usually 4. Ovary 2 celled. Fruit a drupe or capsule.

III. MONOCHLAMYDEÆ (APETALÆ.)

Flowers frequently unisexual. Perianth simple or none (double in some 65 *Euphorbiaceae.*) Stamens few except in some genera and species of 59. *Myristicaceae*, 60. *Lauraceae*, and 65. *Euphorbiaceae*.

59. **Myristicaceæ**. p. 292. Leaves alternate, simple, exstipulate, Sap red. Flowers unisexual, diœcious. Perianth 3-lobed. Anthers, 12-30. Ovary superior 1-celled with 1 erect ovule. Fruit fleshy.

60. **Lauraceæ**, p. 295. Leaves alternate or opposite, simple, exstipulate. Flowers bisexual, polygamous or unisexual. Perianth 6-(or 4.) cleft. Stamens 6-20. Ovary free with one pendulous ovule. Fruit dry or fleshy.

61. **Proteaceæ**, p. 308. Leaves usually alternate, simple, exstipulate. Flowers bisexual. Perianth-segments and stamens 4. Ovary 1-celled with 2 ascending ovules. Fruit dry.

62. **Thymeleaceæ**, p. 309. Leaves opposite or alternate, simple, exstipulate. Flowers bisexual. Perianth-segments 4 or 5. Stamens 5-10. Ovary superior 1- or 2-celled with one pendulous ovule in each cell. Fruit dry.

63. **Elaeagnaceæ**. p. 310. Leaves alternate, simple, exstipulate, covered with scales. Flowers bisexual. Perianath-segments and stamens 4. Ovary superior, 1-celled with one erect ovule. Fruit indehiscent.

64. **Santalaceæ**. p. 311, Leaves alternate or opposite, simple. Flowers bisexual or polygamous. Perianth-segments 4-8. Stamens 4 or 5. Ovary inferior, 1-celled with 2 or 3 ovules. Fruit a 1-seeded nut or drupe.

65. **Euphorbiaceæ**, p. 315. Leaves usually alternate, simple and stipulate. Sap often milky. Flowers unisexual. Perianth simple or double. Stamens 1, few or many. Ovary superior, generally of 1-3 carpels with 1 or 2 pendulous ovules in each. Fruit a 3-celled capsule or a drupe.

66. **Ulmaceæ**, p. 350: Leaves alternate. simple and stipulate. Sap watery. Flowers bisexual. Perianth 4-9-lobed. Stamens opposite them and equal in number. Ovary superior of 2 carpels. Fruit a samara or drupe.

67. **Moraceæ**, p. 354. Leaves usually alternate and simple; stipules large. Sap milky. Flowers unisexsal. Perianth of 2-6 segments. Ovary 1-celled with 1 pendulous ovule.

68. **Urticaceæ**, p. 374. Leaves alternate, simple and stipulate. Sap watery. Flowers unisexual. Perianth segments and stamens 3-5. Ovary 1-rarely 2-celled. Fruit usually fleshy.

69. **Myricaceae**, p. 377. Leaves alternate, simple and aromatic stipules none. Flowers unisexual. Stamens 2-16. Ovary 1-celled-Fruit a nut.

70. **Casuarinanceæ**, p. 377. Leafless trees with cylindrical jointed branchlets. Flowers unisexual, male monandrous, female 1-celled with 2 collateral ovules. Fruit an oblong cone.

71. **Sailcaceae**, p. 380. Leaves simple, alternate, stipulate. Flowers unisexual. Perianth none. Stamens 2-12. Ovary 1-celled with many ovules. Fruit a 2-valved capsule containing seeds enclosed in silky hairs.

GYMNOSPERMS.

Flowers unisexual, perianth incomplete or absent. Ovules not enclosed in an ovary and fertilized directly by the pollen. Seeds naked.

72. **Coniferæ**, p. 381. Leaves alternate, rigid, linear. Sap resinous. Flowers without a perianth, monœcious and diœcious. Anthers many. Ovules naked, sessile, arranged in cones. Seeds often winged.

73. **Cycadaceæ**, p. 382. Leaves consisting of short prophylla and true pinnate leaves in terminal tufts. Flowers diœcious without a perianth, male in erect cones. female in crowded whorls round the top of the trunk.

MONOCOTYLEDONS.

Seed-leaf only one. Pith, wood and bark not distinct. Growth from the inside. Perianth when present, stamens and carpels in threes or multiples of three.

SPADICIFLORAE.

74. **Palmeæ**, p. 384. Leaves alternate or crowded round the top of the trunk, usually compound. Flowers uni or bi-sexual in a spadix enclosed in one or more spathes. Perianth inferior, segments 6. Stamens 3 or 6. Ovary 1-3-celled. Fruit a drupe or berry.

75. **Pandanaceæ**, p. 394. Leaves liner or lanceolate. Flowers diœcious, without a pesianth, arranged in a spadix clothed with leafy spathes. Stamens many. Fruit drupaceous or a many-seeded berry.

GLUMIFERAE.

76- **Gramineæ**. (**Bambuseae**,) p. 395. Leaves alternate, distichous and narrow, on long split sheets. Stems more or less hollow, jointed. Flowers usually bisexual arranged in spikelets. Stamens 3 or 6, sometimes numerous. Fruit 1-seeded.

THE
FOREST TREES
OF
TRAVANCORE

THALAMIFLORÆ

ORDER I. DILLENIACEÆ.

TREES with simple alternate, penniveined leaves. Flowers regular, bisexual. Sepals 5, imbricate, persistent. Petals 5, imbricate, deciduous. Stamens numerous, in many series. Carpels 1 or more. Styles distinct. Seeds few.

1. DILLENIA, Linn.

Characters of the Order. Only one species found in Travancore.

D. pentagyna. Roxb. Fl. Br. I. i. 38. Brandis For. Fl. 2. Beddome Fl. Syl t. 104. Gamble Man. Tim. 6. Tam. *Nai thekku*. Mal. *Koddapunna*: *pattipunna*: *valapunna*.

Leaves oblong-lanceolate, acute, serrate, with numerous parallel ribs, 1-2 ft. long. Petiole short, winged. Flowers before the leaves, sweet-scented, yellow, about 1 inch across, very numerous, borne on the branches. Fruit globose, succulent, yellow, $\frac{3}{4}$ in. diameter.

A medium-sized deciduous tree, very common in grass land between 0 and 3,000 ft. throughout Travancore. Height 70 ft. Diam. $1\frac{1}{2}$ ft. Common throughout India. Flowers Jan.—March. Fruit ripens May—June.

Bark grey, blotched with white, smooth, $\frac{1}{2}$ in. thick. Wood rough, hard, reddish-brown with a tinge of grey, apt to crack, handsomely marked on a longitudinal section by the rays which appear as broad plates. Pores medium and small, many of them filled with a white substance.

Rays numerous, moderately broad to fine. Annual rings marked by a belt of lighter wood without pores, from 5—8 to the inch.

W.—44 lbs. P.—554.

The wood is used for house-posts, but is of little value, being difficult to work. Gamble says that it is durable, but apt to warp and split. "Elsewhere the buds, flowers and fruits are eaten by the people, and the last named by deer. The wood is used for house and ship-building, buggy-shafts, rice-mills and charcoal. (Dict. Econ. Prod.)"

ORDER II. MAGNOLIACEÆ.

Trees with convolute, deciduous stipules and alternate leaves. Flowers regular, bisexual, large, trimerous. Sepals and petals all similar, in whorls of 3, imbricate, deciduous. Stamens numerous, free. Ovaries many. Ripe carpels dehiscent. 1—4-seeded.

MICHELIA, Linn.

Leaves simple. Stipules conspicuous. Flowers axilliary. Filaments flat. Carpels supported on a gynophore, many, each with 2 or more ovules. Fruit a spike of 1—12 two valved carpels.

Leaves 8-10 in. Fls. yellow, 2 in. diam. Sep. and pet. 15-20... 1. *M. champaca.*

Leaves 2-4 in. Fls. white, 3-4 in. diam. Sep. and pet. 9-12...2. *M. nilagirica.*

2 1. **M. Champaca**, Linn. Fl. Br. I. i, 42. Brandis For. Fl. 3. Beddome Fl. Syl. vi. Gamble Man. Timbers 12. Eng. *Champak*, Tam. *Chambaggam.*

Leaves ovate-lanceolate, acuminate, shining, strongly reticulated, 8—10 in. by $2\frac{1}{2}$ to 4 in. Petiole 1—$1\frac{1}{2}$ in. Flowers each with a bract, sweet-scented yellow, 2 in. across. Sepals and petals 15-20, outer obovate, inner narrow. Carpels sessile, orbicular. Seeds 1-12 oval, brown, of the size of a pea.

A large umbrageous tree reported to occur in the evergreen forests at high elevations (4-7000 ft.) in North Travancore, and cultivated in many places especially near temples. Height 70 ft. Diam. 3 ft. Found elsewhere in North India, Pegu etc., and cultivated throughout India. Flowers in May. Fruits Nov.—Dec.

Bark grey, $\frac{1}{2}$ inch thick, sapwood whitish, heart olive-brown. Annual rings distinct. Pores small and evenly distributed. Rays short numerous, fine. The timber is good, close-grained and very durable, especially underground.

Gamble gives the rate of growth at 7 rings to the inch.

W.=37 lbs. P.=589.

The wood is used for furniture, carriage-building and house-building. It polishes well. "In other parts of India, the flowers when boiled yield a yellow dye, and when distilled a sweet scented volatile oil. The flowers, fruits, leaves, bark and roots are used medicinally. The wood is very durable and is much used. (Dict. Econ. Prod.)"

2. **M. nilagirica,** Zenk. Fl. Br. Indi. i. 44, Beddome Fl. Syl. t. 62, Trimen Fl. Cey. i. 14. Gamble Man, Tim. 13. Eng. *White Champak.* Tam. *Katta chambaggam.*

Leaves lanceolate, tapering at both ends, 2-4 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. Flowers 3-4 in. across, white. Sepals and petals 9-12, outer broad, inner narrow. Carpels sessile. Fruit 2-3 in. long, of many warty yellow carpels, each $\frac{2}{3}$ in. long, containing 1-2 scarlet seeds.

A large tree found in the forests of North Travancore at elevations between 4-7000 ft. Height 60 ft. Diameter 2 ft. Occurs also on the Neilgherries and in Ceylon. Flowers March—April.

Bark brown and cracked. Wood moderately hard, smooth, olivebrown, sapwood grey. Annual rings marked by a pale line. Pores small. Rays fine and numerous.

Gamble says that the growth is slow, 16-18 rings per inch, and gives

W = 38 lbs.

The wood is much used in Ceylon and the Neilgherries, and is considered very durable. It has been successfully tried for sleepers.

ORDER III. ANONACEÆ.

Trees with alternate, exstipulate, simple, entire leaves. Flowers regular, bisexual. Sepals 3, free or connate, usually valvate. Petals 6, in two rows. Stamens indefinite or rarely definite, the connective produced. Ovaries numerous or few. Ovules 1 to many. Seeds large.

This Order is largely represented in Travancore. The timber of all the species examined is very similar. It is yellowish, soft, light and elastic. The rays are joined by numerous fine transverse bars which are very characteristic.

Stamens close-packed, (over 30) their anther-cells concealed by the overlapping connectives.

Petals all similar.
- Petals connivng at base and covering stamens and ovaries ... 1. *Cyathocalyx.*
- Petals flat, spreading from the base.
  - Ovules 2—6 on the ventral suture ... ... 2. *Unona.*
  - Ovules 1—2, basal ... ... 3. *Polyalthia.*
- Inner petals valvate, connivent ... ... 4. *Popowia.*

Inner petals dissimilar, arching over the stamens and pistil.
- Ovules 1—2 ... ... 5. *Goniothalamus.*
- Ovules many ... ... 6. *Mitrephora.*

Inner petals similar but smaller ... ... 7. *Xylopia.*

Stamens loosely packed, (6-30), their anther-cells not concealed by the connectives.

Petals valvate.

Inner petals largest.	Ovules definite	...	... 8. *Miliusa*.
Inner petals largest.	Ovules indefinite	...	... 9. *Saccopetalum*.
All petals equal.	Ovules 4—8	...	... 10. *Alphonsea*.
Inner petals clawed.	Ovules 2—4	...	... 11. *Orophea*.
Petals imbricate, sub-equal.	Ovules 2-8	...	... 12. *Bocagea*.

1. CYATHOCALYX. Champion.

Leaves glabrous. Flowers fascicled or leaf-opposed. Sepals combined into a cupshaped calyx. Petals valvate in bud, bases conniving. Stamens truncate. Carpels solitary with several ovules. Fruit, woody.

C. zeylanicus. Champion. Fl. Br. I. i. 53. Beddome Fl. Syl ix. Trimen Fl. Cey. i. 20. Gamble Man. Tim. 16.

Leaves very glabrous, young leaves pale, lanceolate, acuminate, 5-10 in by 2-3 in. Petiole ½ in Flowers in short fascicles 1-3 together, pale-green, 2-2½ in. long, buds golden-tomentose. Pedicels ½-1 in not hooked. Sepals obscurely lobed. Petals greenish-brown, pubescent Stamens indefinite. Stigma large, peltate. Fruit a large ovoid berry the size of a goose's egg, containing 6 or 8 seeds, smooth, about 3 in. long, yellow when ripe.

A medium-sized evergreen tree with drooping branches occurring in moist forests at 1,500 ft. elevation, at Merchiston Estate. Height 40 ft. Diam. 6 in. Flowers in May. Fruit in May—June. Occurs also in Malabar and in Ceylon. Growth rapid. Bark smooth, dark coloured. Wood yellowish-white, moderately hard. It is not used.

2. UNONA, Linn.

Small trees. Sepals valvate. Petals nearly equal, flat. Stamens indefinite, cuneate, ovaries numerous, ovules 2-8. Ripe carpels many, usually stalked.

5 **U. pannosa.** Dalz. Fl. Br. I. i. 58. Beddome Fl. Syl. ix. Gamble Man. Tim. 16.

Leaves dark-green and glossy above, pale below, veins distinct, about 7 on each side, lanceolate, acuminate 2-4 in. by ¾-1 in. Flowers solitary in the axils of the leaves, sessile, dirty-white, more than 2 in. long. Sepals green, downy, small. Petals villous, the outer 3 rather longer than the inner. Ovaries 10-12. Fruit a cluster of rounded berries ½-¾ in. long. Seeds 1-3 the size of peas.

A small tree with horizontal branches common in all evergreen forests throughout Travancore between 2,000 and 4,000ft. Height 30ft. Diam. 6 in. Flowers in January—February and in July. Fruits in November. Occurs also in Malabar.

Bark smooth, yielding a strong fibre. Wood tough.

3. POLYALTHIA. Blume.

Flowers solitary or many. Sepals valvate, rarely imbricate. Petals equal, flat. Stamens indefinite. Carpels numerous. Ovules 1-2. Fruit a cluster of 1-seeded berries on long stalks.

Petals linear.

- Leaves glabrous. Fls. umbelled, 1 inch long, axillary . 1. *P. longifolia*
- Leaves glabrous. Fls. solitary or few together, 2½ ins. long, growing on the old wood . 2. *P. coffeoides.*
- Leaves pubescent beneath. Fls. many, 1 inch long. from axils of fallen leaves . 3 *P. fragrans.*

Petals broad.

- Leaves pubescent. Petals equal. ½ inch long, axillary. Flowers 1—3 together 4. *P. cerasoides*
- Leaves pubescent. Outer petals ¼ inch, inner ½ inch. Flowers solitary . 5. *P. suberosa.*

1. **P. longifolia.** Benth and Hook f. Fl. Br. I. i. 62. Beddome 6
Fl. Syl. t. 38. Brandis For. Fl. 4, Trimen Fl. Cey. i. 24. Gamble Man. Timbers, 18. Mal. *Choruna : aruna ; asotham.*

Leaves glabrous, lanceolate, acuminate 5-9 in. by 1-2 in. Flowers in axillary umbels, 3-10 together, pedicels 1 in. or more, green. Sepals broad. Petals narrow, ½ in. long. Carpels about 8, ovoid, I in. long, purple, on ½ in. stalks.

A tall evergreen tree with slender branches, not indigenous, but run wild in the low country. Planted in avenues. Height 50 ft: diam. 1½ ft. Fls. March to May. Fruit July to August. Native of Ceylon.

Bark smooth, wood yellowish-white, very elastic. Pores small, evenly distributed. Rays fine to broad, crossed by fine transverse bars. Gamble gives

W. = 37 lbs. P. = 547.

Wood used for making drums, carriage shafts &c.

2. **P. coffeoides.** Benth and Hook f. Fl. Br. I. i. 62. Beddome 7
Fl. Syl. t. 73. Trimen Fl. Cey. i. 24. Gamble Man. Tim. 17 Mal. *Villa.*

Leaves lanceolate, acuminate glossy above, 4-9 in. by 1-2 in. Flowers 3 in. across, pale yellow, borne on the branches and all up the stem, either singly or in clusters. Sepals 3, round. Petals 6 about 1 in. long. flat and strap-shaped. Stamens indefinite. Carpels 6-12, about 1 in. long. on ½-1 in. stalks, purple when ripe.

A medium-sized evergeen tree with a straight trunk covered with knots from which the flowers grow, common in all our moist forest, from 1,000 to 4,000 ft. Height 80 ft. Diam. 1 ft. Flowers in March and November. Fruit ripens in January. Occurs in Malabar and in Ceylon.

Bark dark-green, mottled with greyish-white, smooth but for the characteristic excrescences. Timber unknown. Beddome says that its bark is used for ropes.

3. **P. fragrans.** Benth and Hook f. Fl. Br. I. i. 63. Beddome 8
Fl. Syl. t. 74. Gamble Man. Tim. 18. Tam. and Mal. *Nedunar pularrei : chela.*

Leaves oblong-lanceolate, acuminate, pubescent above, veins prominent beneath, about 13 pair. Length 4-9 in by $1\frac{1}{2}$-$4\frac{1}{2}$ in. Flowers fragrant, straw-coloured, cymose, from the axils of fallen leaves, many : pedicels 1 in. Sepals small, green, orbicular. Petals narrow, about 1 in. long. Stamens indefinite. Carpels $\frac{3}{4}$-$1\frac{1}{2}$ in. ovoid, on stalks 1 in. long.

A very tall straight stemmed tree, common throughout Travancore from 0—2,000 ft. in evergreen forests. Height 100 ft. Diam. 2 ft. Flowers in December to January and in June to July. Fruit in May and November. Occurs also in Malabar and S. Concan.

Bark greenish-grey, blotched with white, smooth, $\frac{1}{4}$ in. thick. Wood hard, smooth, pale yellow, uniform and straight-grained. No heart. Pores small, few, evenly distributed. Rays very numerous, fine to medium, crossed by many fine transverse bars. Annual rings indistinct, about 6 to inch.

W.=41 lbs. P.=567.

This tree is much felled for masts for native craft on account of its straightness and elasticity. It improves much by seasoning. "The wood is bored by insects and does not last."

A medium-sized tree with a heavier wood than *P. fragrans* but resembling it, called *Vilpunna* is found in the forests on the Periyaur. The leaves are glossy and dark-green above, pale beneath, with 18-20 pairs parallel, strongly marked, nerves, 6-10 in. by 3-4 in : margin of leaf undulate. Petioles $\frac{1}{3}$in. I have never seen the flowers. It may prove to be new.

9 4. **P. cerasoides.** Benth and Hook f. Fl. Br. I. i. 63. Beddome Fl. Syl. t. 1. Brandis For. Fl. 5, Gamble Man. Tim. 17.

Leaves lanceolate, acuminate, glabrous above, pubescent beneath, dark green, 2-8 in. by 1-2 in. Flowers pale green, on pedicels $\frac{1}{2}$-1 in. long, solitary or 2-3 together, axillary or on short branchlets. Sepals green, broad. Petals lanceolate, $\frac{1}{2}$ inch long. Stamens indefinite. Carpels numerous dark-red, smooth $\frac{3}{4}$ in. long, on stalks $\frac{3}{4}$-1 in.

A medium-sized evergreen tree found in the open forests about Puliyara at 1,000 ft. and sometimes cultivated. Height 50 ft. Diam. 1 ft. Flowers from March to May. Fruits July to August. Occurs also on the Western Ghats, Behar and Burma.

Bark smooth, dark. Gamble says the wood is olive-grey, moderately hard, close-grained. Pores small. Rays short, broad and moderately fine, crossed by numerous, fine transverse bars, and gives

W=52 lbs.

The wood is much appreciated in Bombay, but is not used in Travancore, where, indeed, it does not attain a large size.

10 5. **P. suberosa,** Benth, & Hook, f. Fl. Br, I. i. 65. Brandis For. Fl. 5. Trimen Fl. Cey. i. 25. Gamble Man. Tim. 17.

Leaves oblong, obtuse, glabrous above, pubescent beneath, $2\frac{1}{2}$-5 in by 1-$1\frac{3}{4}$ in. Flowers pale red, small, solitary, on slender pedicels $\frac{1}{2}$-1 in. long. Sepals small triangular. Petals unequal, outer

ovate, $\frac{1}{4}$ in long, inner oblong, $\frac{1}{2}$ in. long. Stamens indefinite. Carpels purple, many, of the size of a pea, on stalks $\frac{1}{2}$ in. long.

A small evergreen tree found by Lawson in S. Travancore, not seen by me. Brandis says that it flowers throughout the year, but chiefly in April and May. Fruit ripens in Feb.-March. Occurs also in Ceylon, Burmah and parts of North India and Malabar.

Bark with a thick rough layer of cork. Wood close, hard, tough and durable, olive-grey. Pores small. Gamble gives

W. = 40 lbs.

4. POPOWIA. Endl.

Flowers small, extra-axillary or leaf-opposed. Sepals 3, ovate, valvate. Petals valvate, in 2 series, outer spreading, inner thick, concave, connivent. Stamens indefinite. Carpels about 6, ovules 1-2. Style large, recurved. Fruit stalked.

P. Beddomeana, Benth. & Hook. f. Fl. Br. I. i. 68. 11
Beddome Fl. Syl. VIII. (under *P. ramosissima*). Gamble Man. Tim. 20.

Leaves ovate, when young tomentose, smooth above, 2-3 in. by 1-$2\frac{1}{2}$ in. Flowers $\frac{1}{3}$ in. across, globose. villous. Stamens about 24. Ovaries 4-7. Ovules solitary.

A small tree of the evergreen forests about Agusteer Peak, 3-5000 ft., found by Beddome, not seen by me. Endemic.

5. GONIOTHALAMUS. Blume.

Small trees. Sepals distinct. Petals in 3 rows, outer thick, flat, inner connate by their margins to form a cone over the stamens and ovary. Stamens indefinite. Ovaries many. Ovules 1 or 2. Ripe carpels 1-seeded.

Outer petals glabrous, $1\frac{1}{2}$ inch or more. Leaves oblong. 1. *G. Thwaitesii.*
Outer petals pubescent, less than $1\frac{1}{2}$ inch. Leaves lanceolate . 2. *G. Wightii.*

1. **G. Thwaitesii**, Hook f. and Th. Fl. Br. I. i. 72. Beddome Fl. Syl. VIII. Trimen Fl. Cey. i. 29. Gamble Man. Tim. 19. 12

Leaves oblong, acuminate, glabrous, $3\frac{1}{2}$-7 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in. Flowers large, green; peduncles $\frac{1}{3}$-1 in. Sepals $\frac{1}{3}$ in., broadly ovate, acute. Petals, outer 1-$1\frac{1}{2}$ in. long, ovate, lanceolate, clawed, inner $\frac{1}{4}$-$\frac{1}{3}$ in. ovate, triangular. Style simple. Carpels about 10-20, $\frac{1}{2}$ in. long ovoid.

A small tree common in the moist forests of S. Travancore, between 2000-4000 ft. Flowers in August. Height 25 ft. Diam. $\frac{1}{2}$ foot. Occurs also in Ceylon. Gamble says that the wood is yellowish-white and soft.

2. **G. Wightii**, Hook. f. & Th. Fl. Br. I. i. 76. Beddome Fl. Syl. VIII. Gamble Man. Tim. 18 13

Leaves lanceolate, acute at both ends, glabrous, 3-6 in. by about 1 in. Flowers greenish-yellow, axillary : peduncles $\frac{1}{3}$-1 in. Sepals $\frac{1}{2}$ in. ovate, acute. Petals, outer 1 in., broad, clawed, inner $\frac{1}{2}$ in. Style 2-clawed. Carpels 14-18, ovoid, $\frac{2}{3}$ in. long

A small tree common in all evergreen forests between 2000 & 5000 ft., throughout Travancore. Flowers in April. Height 20 ft. Diameter $\frac{1}{2}$ foot. Bark black, yielding a strong fibre. Timber unknown. Endemic in Travancore and Tinnevelly.

6. MITREPHORA. Blume.

Leaves coriaceous, strongly ribbed. Sepals distinct. Petals valvate, outer distinct, thin, flat, inner clawed, vaulted and cohering. Carpels numerous. Ovules 3 or more. Fruit 2-3-seeded.

14 M. **Heyneana.** Thwaites. Fl. Br. I. i. 77. Beddome Fl. Syl. viii. Trimen Fl. Cey. i. 32. Gamble Man. Tim. 19.

Leaves ovate-lanceolate, acuminate, buds covered with brown tomentum, young leaves pale-green and downy, older dark-green and glabrous, 2-5 in. by 1-2$\frac{1}{2}$ in. Flowers solitary or 2-3 together, axillary or leaf-opposed, sweet-scented, straw coloured, about 2 in. across. Sepals minute, obtuse. Petals, outer oval, about 1 in. by $\frac{2}{3}$ in. yellow, inner $\frac{1}{8}$ in. acute, yellow, streaked with pink. Stamens indefinite. Ovaries 20 or 30, hairy. Ovules 2 or 3. Carpels 8-9 together, brown, ovoid, sessile, $\frac{1}{2}$ in. long.

A medium-sized tree of the evergreen forests, seen at Ariyankavu, 2000 ft. Height 50 ft. diam. 1 ft. Occurs also in Ceylon.

Flowers February-March. Fruits September-October.

Bark $\frac{1}{4}$ in. thick, smooth, dark-green. Wood pale yellow, strong, hard, smooth and straight grained. No heart. Pores small, evenly distributed. Rays very abundant, long and conspicuous, crossed by numerous wavy bands.

W = 60 lbs. P = 1189.

7. XYLOPIA. Linn.

Leaves coriaceous. Sepals more or less connate into a calyx. Outer petals narrow, flat, inner similar but smaller. Ripe carpels ovoid, several-seeded

15 X. **Parvifolia,** Hook f & T. Fl. Br. I. i. 84. Beddome Fl. Syl. IX. Trimen Fl. Cey. i. 28 Gamble Man. Tim. 20. Mal. *Santhu.* Tam. *Kal potta.* § Leaves narrowly oval, acuminate, glabrous, 1$\frac{1}{2}$-5 in. by $\frac{1}{2}$-1$\frac{1}{2}$ in. Petiole $\frac{1}{4}$ in. Flowers yellow, $\frac{3}{4}$ in. across axillary, 3 or 4 together, and also along the branchlets on very short pedicels. Sepals minute, united half way up. Petals hairy, outer $\frac{1}{2}$-$\frac{2}{3}$ in. long, linear, inner a little shorter. Ovaries 5, with 4-6 ovules. Carpels ovoid, 1$\frac{1}{2}$ in. long × $\frac{3}{4}$ in. broad, green.

A very tall, but slender, evergreen tree, common in the moist forests at Colatoorpolay and near Ariyankavu, between 0-2000 ft. Height 80 ft. Diam. 1$\frac{1}{2}$ ft. Occurs also in Ceylon.

Flowers August to September. Fruits November to January.

Bark brown, smooth, $\frac{1}{4}$ in. thick. Wood coarse, moderately hard, greyish-white, uniform and straight-grained. No heart. Pores small, evenly distributed. Rays very abundant and very fine, crossed by numerous equidistant transverse bars. Annual rings not distinct, about 15 to inch.

W.—44 lbs. P.—725.

Timber not used and said to be worthless. It is liable to be bored by insects.

8. MILIUSA. Leschenault

Flowers green. Sepals small, valvate. Petals valvate, outer smaller, like the sepals, inner larger, cohering when young. Stamens 20-30. Anther-cells not concealed. Overies indefinite. Ovules 1-2.

Leaves less than $1\frac{1}{2}$ in. broad, glabrous.
Carpels glabrous ... 1. *M. Wightiana.*
Leaves more than $1\frac{1}{2}$ in. broad, tomentose
Carpels downy ... 2. *M. velutina*

1. **M. Wightiana**, Hook. f & T. Fl. Br. I. i. 87. Beddome Fl. Syl. X. Gamble Man. Tim. 21. 16

Leaves lanceolate, acuminate, glabrous, $1\frac{1}{2}$-4 in. by $\frac{1}{2}$-1 in. Petiole 1/12 in. Flowers axillary. Sepals and outer petals very small, inner petals about $\frac{1}{2}$ in. long. Carpels 1-2-seeded on long stalks.

A small evergreen tree found at Mutthu Kuli Vayal, and seen elsewhere by Beddome at elevations from 3000-5000 ft. Height 25 ft. Diam. 8 in. Endemic in Travancore and Tinnevelly.

Timber not known.

2. **M. velutina**. Hook. f. & T. Fl. Br. I. i. 87. Beddome Fl. Syl. t. 37. Brandis For. Fl. 6. Mal. *Kána kaitha: viluni.* 17

Leaves ovate, acute, tomentose on both sides, 3-9 in. by $1\frac{1}{2}$ to 4 in. Petiole $\frac{1}{10}$ in. Flowers 3-6 in. across, in leaf-opposed cymes. Sepals and outer petals very small, inner petals $\frac{1}{3}$ in., dark-brown. Pedicels 2-4 in. Carpels the size of a cherry on $\frac{3}{4}$ in. stalks.

A medium-sized tree of the deciduous forest, fairly common, but local, near Colatoorpolay, Konni &c., at elevations from 200-1000 ft. Height 70 ft. Diam. $1\frac{1}{2}$ ft. Occurs also in Burmah and Bengal and Central India.

Flowers Jan.-March. Fruits March-May.

Bark brown, deeply cracked. $\frac{1}{2}$ in. or more thick. Wood yellow when fresh, light-brown when old, with a dark purple patch in the centre, but no regular heart, moderately hard, elastic, easily worked and durable. Pores small, rather scanty, evenly distributed. Rays medium, prominent, crossed by fine transverse bars. Annual rings not seen.

W. = 50 lbs. P. = 847.

Wood occasionally used for carriage shafts. Elsewhere employed for agricultural implements, oars &c. Gamble says it is easily worked and durable, but is liable to warp.

9. SACCOPETALUM. Bennett.

Leaves deciduous. Flowers axillary. Sepals small, valvate. Outer petals, small, sepaloid. inner much larger, base saccate. Stamens indefinite. Connective produced but not concealing the anthers. Ovaries numerous. Ovules 6 or more.

18 1. **S. tomentosum,** Hook. f. & T. Fl. Br. I. i. 88. Beddome Fl. Syl. t. 39. Brandis For. Fl. 7. Gamble Man. Tim. 22.

Leaves ovate, acute, glabrus above, pubescent beneath, 4-12 in. by $2\frac{1}{2}$-4 in. Petiole $\frac{1}{4}$ in. Flowers few, cymose, greenish-yellow streaked with brown. Pedicels 2-3 in. Sepals and outer petals $\frac{1}{6}$ in. inner petals $\frac{2}{3}$ in. Carpels 1 in. diam., purple, 3-4-seeded.

A large tree, seen by Beddome not by me. Height 50 ft. Diam- 2 ft. Occurs also in Behar, Oudh and on the Western Ghats.

Flowers in April. Fruits June-July.

Gamble says that the bark is $\frac{1}{8}$ in. thick, dark and deeply cracked. Wood yellow to olive-brown, moderately hard, smooth, close-grained. No heart. No annual rings. Pores small and medium, numerous. Rays broad and fine, very numerous, crossed by fine, white transverse bars and he gives

W. = 45 lbs.

The berries are eaten in some parts of Bombay. The leaves are used for fodder and timber for building.

10. ALPHONSEA. Hk. f. & T.

Leaves thick, coriaceous, glabrous. Sepals small, valvate. Petals equal, valvate. Stamens 15-30, loosely packed, not concealed by the connective. Ovaries 1-5. Ovules 4-10 in. 2 rows. Ripe carpels 1-5, with 4-10 seeds.

19 **A. zeylanica.** Hook. f. & T. Fl. Br. I i. 89. Beddome Fl. Syl. x. Trimen Fl. Cey. i. 36. Gamble Man. Tim. 23.

Leaves lanceolate, attenuate at base, obtuse, 2-4 in. by $\frac{2}{3}$-1 in. Petiole $\frac{1}{4}$ in. slender. Buds pubescent. Flowers solitary or 2 together, yellow-green. Petals $\frac{1}{2}$ in. ovate, acute. Stamens 30. Ovaries 1-5. Ripe carpels on 1 in-stalks, globose, 1-$1\frac{1}{2}$ in. diam.

A medium-sized tree, said by Beddome to be not uncommon in our evergreen forests between 2000 and 3000 ft. Occurs also in Tinnevelly and Ceylon.

Flowers Sep.-March

Timber not known.

11. OROPHEA. Blume.

Small trees. Sepals distinct. Petals valvate, inner much larger, clawed, forming a cone over the organs. Stamens 6-12, loosely

packed, anthers not concealed. Ovaries 3-15. Ovules 2-4. Ripe carpels 1-2-seeded.

Stamens 6 ... 2. *O. Zeylanica.*
Stamens 12
Peduncles 1-flowered ... 1. *O. Uniflora.*
Peduncles 3-4 flowered
Carpels round $\frac{1}{3}$ in. ... 3. *O. Thomsoni.*
Carpels oblong, 1 in. ... 4. *O. Erythrocarpa.*

1. **O. uniflora.** Hook. f. & T. Fl, Br. I. i. 90. Beddome Fl. Syl. xi. Gamble Man. Tim. 19. 20

Leaves $1\frac{1}{2}$-$2\frac{1}{2}$ in. by $\frac{3}{4}$-1 in., elliptic-lanceolate, acuminate, glabrous. Petiole 1/12 in. Flowers solitary on $\frac{1}{2}$ in. pedicels. Outer petals 1/6 in., inner $\frac{1}{2}$ in., tapering into the claw. Ovaries 2. Stamens 12. Ripe carpels $\frac{1}{2}$ in diam. brown-black.

A small tree seen by Beddome and Wight in our forests up to 4000 ft., not by me. Endemic. Timber unknown.

2. **O. zeylanica.** Hook. f. & T. Fl. Br. I. i. 90. Beddome Fl. Syl. xi. Trimen Fl. Cey. i. 35. Gamble Man. Tim. 19. 21

Leaves ovate, acute, glabrous, 2-$3\frac{1}{2}$ in. by 1-$1\frac{3}{4}$. Petiole 1/12 in. Flowers greenish brown, 1-4 together, $\frac{1}{2}$ in. across. Peduncle 1-2 in. Outer petals $\frac{1}{4}$ in., inner larger forming a cone. Stamens 6. Ripe carpels few, $\frac{1}{3}$-$\frac{1}{2}$ in. diam., globose, 1-2 seeded.

A small tree found by Beddome in Travancore at elevations up to 4000 ft. not by me. Occurs also in Coorg and in Ceylon. Timber unknown. Flowers in September.

3. **O. Thomsoni.** Bedd. Fl. Br. I. i. 91. Beddome Fl. Syl. xi. Gamble Man. Tim. 19. 22

Leaves oblong-acuminate, glabrous, 1-2 in. by 1-$1\frac{1}{4}$ in. Petiole $\frac{1}{8}$ in. Peduncles short axillary, 3 flowered. Stamens 10-12. Ovaries 5-6, hairy. Ovules 2. Ripe carpels the size of a pea.

A small tree found by Beddome in our forests between 1500 and 4000 ft. not by me. Occurs also on the Western Ghats.

Timber unknown.

4. **O. erythrocarpa.** Bedd. Fl. Br. I. i. 91. Beddome Fl. Syl. xi. Gamble Man. Tim. 19. 23

Leaves 2-$4\frac{1}{2}$ in. by 1-2 in. oblong-acuminate, glabrous above, pubescent beneath. Petiole $\frac{1}{3}$ in. Peduncles 3-4 flowered, tomentose, 1 in. Flowers very small, $\frac{1}{2}$ in. across. Inner petals $\frac{1}{4}$ in. Stamens 12. Ovaries 6. Ovules 2. Ripe carpels oblong, 1 in. long, red.

A small tree found by Beddome in our moist forest between 1,000 and 2,000 ft. found in the Shendruni valley. Endemic. Timber unknown.

12. BOCAGEA. St. Hil.

Leaves coriacous. Sepals small. Petals equal, one or both rows imbricate. Stamens 6-24, loosely packed. Connective produced but not concealing anthers. Ovaries 1-6. Ovules 2-12. Ripe carpels 1-4, with 4-8 seeds, globose, or ovoid.

24 **B. Dalzellii.** H. f. & T. Fl. Br. Ind. 1. 92. Bedd. Fl. Syl. viii (under *Sageræa Dalzelli*) Gamble Man. Tim. 15 (under *S. laurina*) Mal. *Manja nára* : *kána kaitha* : *manyarei*.

Leaves very glossy, dark-green and drooping, narrowly elliptic, 4-12 in by $1\frac{1}{2}$-4 in. Petiole $\frac{1}{2}$ in. Branches very black. Flowers in clusters on the branches at the axils of the old leaves, about 3-12 together, on stalks 1 in. long, each $\frac{3}{4}$ in. across, ivory-yellow. Sepals small. Petals $\frac{3}{8}$ in long. Stamens about 20. Ovaries 3-5. Ovules about 8. Stigma entire. Ripe carpels 2 in. or more long.

A handsome, evergreen tree with a straight black stem and pyramidal shape. Foliage drooping and glossy. Height 60 ft. Diam 1 ft. It occurs in our moist forests from 0-2000 ft. throughout Travancore. Also found in Malabar.

Flowers November to January. Fruits July to August.

Bark black, smooth, $\frac{1}{4}$ in thick. Wood pale-yellow, uniform, straight and close-grained, hard. Pores small, few, evenly distributed. Rays very numerous, fine to medium, crossed by numerous, very fine, transverse bars. Annual rings indistinct, about 5 to the inch.

W—49 lbs. P—788.

The wood is used for carriage-shafts, being tough and elastic, and for bows by the Hillmen. The tree is very ornamental and is well worth cultivating.

ORDER IV. BERBERIDEÆ.

Small trees with pinnate or simple leaves. Flowers regular bisexual, yellow or white. Sepals and petals free, very caducous imbricate. Sepals 6 in 2 rows. Petals 6 in 2 rows. Stamens 6, opposite petals. Carpel 1. Ovules few, basal. Ripe carpels fleshy, indehiscent.

BERBERIS. Linn.

Characters of the Order.

25 **B. nepalensis.** Spreng. Fl. Br. I. i. 109. Beddome Fl. Syl. xii. Brandis For. Fl. 12. Gamble Man. Tim. 28. Tam. *Maranthu*.

Leaves 6-18 in. odd-pinnate, with about 17 opposite leaflets, verticelled at the ends of the branches, each leaflet sessile, ovate or lanceolate, spinously toothed, palmately 3-5 nerved, from 1-5 in. by $\frac{1}{2}$-1 in. broad, coriaceous, dark-green and glabrous. Flowers in erect racemes 3-12 in. long, yellow, each flower about $\frac{1}{3}$ in. across. Peduncles $\frac{1}{4}$ in. Berry globose, blue, covered with white bloom, $\frac{1}{3}$ in. long.

A small tree growing in the sholas on the High Range between 5,000 and 6,000 ft. Height 20 ft. Diam. 6 in. Occurs also on the Himalayas, Khasya Mts., Nleigherries and in Tenasserim.

Flowers and fruits in January.

Gamble says that the bark is soft and corky. Wood bright-yellow and hard. Pores small, arranged in radial lines or patches, Rays rather broad, prominent and numerous.

He gives

W—45 lbs,

The Hillmen use the bark, which is scented, for snake-bites,

ORDER V. CAPPARIDEÆ.

Small trees. Leaves simple or compound, alternate, Flowers regular, bisexual. Sepals and Petals 4, valvate or imbricate, Stamens 4 or more, inserted at the base of a long gynophore. Ovary usually stipitate, I-celled, ovules numerous. Fruit fleshy or dry. Seeds with a curved embryo.

CRATÆVA, Linn.

Leaves 3-foliolate. Flowers large, yellow or purplish. Petals open in bud, long-clawed. Stamens indefinite. Ovary stipitate. Stigma sessile. Berry fleshy with a hard rind. Seeds embedded in pulp.

C. Nurvala, Ham. Fl. Br. I. i. 172. Beddome Fl. Syl. t. 116. 26
Brandis For. Fl. 16. Trimen Fl. Cey. i. 59 (under *C. Roxburghii*). Gamble Man. Tim 32. Tam. *Mivallankai.* Mal. *Nir :Mathalam: killi* :

Leaves trifoliolate, middle leaflet longest, $2\frac{1}{2}$-6 in. by $1\frac{1}{4}$-$2\frac{1}{3}$ in. leaflets ovate-lanceolate, acuminate. Leaves deciduous, on 4-inch petioles. Flowers 2 in. across, in many-flowered, terminal corymbs, yellowish-white often tinged with purple. Peduncles 1-9 in. Sepals very small. Stamens about 18. very long, purple. Fruit ovoid, 2 in. long, pale-brown. rough, covered with white specks.

A small tree, very common along all river sides in Travancore in the low country, also planted. Confined to the western coast of India and Ceylon. The common Indian species is C. Roxburghii. Height 30 ft. Diam. 1 ft.

Flowers from December to April. Fruits August to September.

Bark grey, smooth and very thin, $\frac{1}{8}$ in. Wood very soft, elastic. coarse, greyish-white. Pores often divided, numerous, of medium-size, uniformly distributed. Rays medium-sized, prominent. Annual rings indistinct. No heart. My experiments gave

W—28 lbs. P—279.

But Gamble considers that the wood could not have been good as the average weight of several specimens examined by him was 42 lbs. This is quite possible.

The wood is soft, and is considered useless with us, but in other parts of India it is used for drums, models etc., and for turning, but it is not durable and is liable to be bored by insects. The bitter leaves are used medicinally, especially for rheumatism. (Pharm. Ind. i. 134.)

ORDER VI. VIOLACEÆ.

Trees with alternate, entire or serrate, stipulate leaves. Flowers regular or not, bisexual or polygamous. Sepals and petals 5, imbricate. Stamens 5: connective broad, produced. Ovary 1-celled, sessile. Ovules attached to 3 parietal placentas. Fruit a 3-valved capsule, seeds few, small.

ALSODEIA. Thouars.

Flowers polygamous with many bracts, small, regular. Ovules 1 or 2 on each placenta. Style straight. Stigma 3-lobed. Seeds 3.

27 **A. zeylanica.** Thwaites. Fl. Br. I. i. 187. Beddome Fl. Syl. t 229. Trimen Fl. Cey. i. 68. Gamble Man. Tim. 37.

Young shoots pubescent. Leaves lanceolate, serrulate, acuminate, glabrous, 3-5 in. by $1\frac{1}{4}$-2 in. Stipules free, $\frac{3}{8}$ in. Flowers axillary, sub-sessile, cream, $\frac{1}{6}$ in. across. Petals twice as long as sepals, acute. Fruit $\frac{1}{3}$-$\frac{1}{2}$ in globose, smooth containing 1-3 seeds.

A small tree found in the evergreen forests near Ariyankavu 1,000 ft. and elsewhere, sometimes 20 ft. high, more often shrubby. Occurs also in Malabar and Ceylon. Wood not known.
Flowers March to May.

ORDER VII. BIXINEÆ.

Trees with alternate leaves, sometimes spinous. Stipules generally absent. Flowers regular, bisexual, or unisexual and diœcious. Sepals 4-6, deciduous, imbricate. Petals 4-6 or 12 or absent, imbricate or contorted. Stamens 5-8 or many. Ovary 1 or 3-5 celled with 3-7 parietal placentas. Fruit an indehiscent berry. Seeds few or many.

This is an important Order containing 7 trees indigenous in Travancore, and most of them very commonly seen. To it belongs the Annotta tree of Tropical America, *Bixa orellana*, which yields a yellow dye used for colouring butter. It has been introduced into Travancore and may often be seen wild in the fields. Mal. *Kurangamanchil*. Also *Gynocardia odorata*, which yields *Chaulmugra* oil so useful for leprosy.

Flowers bisexual.
  Leaves compound. Ovary 3-5-celled.
    Petals 5, broad. no scale ... ... 1. *Cochlospermum*.
  Leaves simple. Ovary 1-celled.
    Petals 4-6, small, no scale ... ... 2. *Scolopia*.
    Petals 12, large, with scale ... ... 3. *Asteriastigma*.
Flowers unisexual.
    Petals . Ovary 2-?-celled ... ... 4. *Flacourtia*.
    Petals with a scale. Ovary 1-celled ... 5. *Hydnocarpus*.

1. COCHLOSPERMUM. Kunth.

Trees with coloured juice and digitate leaves. Flowers bisexual. Sepals 5, deciduous. Petals 5, contorted in bud, broad, without scales. Stamens many. Anthers opening by pores. Ovary 3-5-celled. Capsule 3-5-valved, containing numerous, cochleate seeds surrounded by wool.

C. **Gossypium**. DC. Fl. Br. Ind. i. 190. Bedd. Fl. Syl. XIV. Brandis For. Fl. 17. Trimen Fl. Cey. i. 70. Gamble Man. Tim. 37. Tam. *Thannakku : kongillam.* Mal. *Appa kudakka: panyara : parei panyi.* 28

Leaves 5-lobed on long, thick petioles, lobes tomentose beneath, acute, entire, 3-8 in. long. Flowers in terminal panicles, large, bright-yellow, 3-4 in. across. Sepals unequal, downy. Petals spreading. Fruit an ovoid, leathery, brown capsule, 3 in. diam. Seeds black, $\frac{1}{4}$ in. long.

A small, deciduous tree with stout, spreading branches, common on stony, dry hills, more common in S. than in N. Travancore, up to 1,000 ft. Height 30 ft. Diam 1 ft. Occurs also in Bombay and Central India and in Burmah, and often planted near temples.

Flowers February to April when bare of leaves. Fruits April to May.

Bark 1 in. thick, wood extremely soft, greyish-brown, without a heart. Pores large and scanty and the rays broad. Gamble gives

W = 17 lbs.

The wood is quite useless. Gamble says the cotton is useful for stuffing pillows, but there is no sale for it in Travancore. A clear white gum exudes from the bark, and is sold in N. India under the name of *Katira* as a substitute for Tragacanth. (Pharm. Ind. i. 151.) The bark yields a good fibre, and the seeds a bright red oil (Dict. Econ. Prod).

2. SCOLOPIA. Schreber.

Trees with woody spines and simple, exstipulate leaves. Flowers bisexual, in small axillary racemes. Sepals and petals 4-6. Stamens many, connective produced beyond anthers. Ovary 1-celled with few ovules. Berry 2-4-seeded.

Leaves lanceolate, acuminate, crenate. Racemes lax. .. 1. *S. crenata.*
Leaves ovate, entire. Racems compact .. .. 2. *S. Schreberi.*

1. **S. crenata**. Clos. Fl. Br. Ind. i. 191 Bedd. Fl. Syl. t. 78. Trimen Fl. Cey. i. 70 (under *S. acuminata*). Gamble Man. Tim. 39. Tam. *Charalu.* 29

Leaves dark-green, lanceolate, acuminate, crenate, 2-4 in. by 1-2 in. very glabrous. Flowers white, in lax racemes, 3 in. long, each flower $\frac{1}{3}$ in. across. Fruit gobose, apiculate, green, $\frac{2}{3}$ in. diam.

An evergreen tree of moderate size, armed with stout, straight spines when young, and clothed with drooping, glossy foliage, found throughout Travancore at elevations of 2,000 ft. and upwards. Height 50 ft. Diam. 1 ft. Also found in Malabar, Ceylon and China.

Flowers January to April. Fruits July to August.

Beddome says that the wood is white and very hard and dense, so as to resist the saw and injure tools, but nothing is known of its properties in Travancore. The fruit is said to be edible.

30 2. **S. Schreberi.** Gmel. Mal. *Chera kanchi.*

Leaves ovate, entire, obtuse, coriaceous, $1\frac{1}{2}$-$2\frac{1}{2}$ in. by—$1\frac{1}{2}$ in. on short petioles. Flowers white, in compact racemes about 2 in. long, each flower $\frac{1}{3}$ in across. Fruit globose, apiculate, smooth, green, about $\frac{1}{2}$ in. diameter.

A small, evergreen tree with a throny stem, the thorns often compound, found on Nemom hill and other localities in the low country. Height 20 ft. Diam. 6 in.

Flowers March—April. Fruits May-June.

Nothing is known of the properties of this tree, nor have I seen any description of it. My specimens were identified in the Culcutta Herbarium.

3. ASTERIASTIGMA. Bedd.

. Trees with simple, exstipulate leaves. Flowers bisexual, in pascicles on the older branches. Sepals 4. Petals 12, each furnished with a large scale. Stamens about 60. Ovary sessile, 1-celled with 7as placentas. Fruit woody. Seeds many.

31 **A macrocarpa** Bedd. Bedd. Fl. Syl. t. 266. Gamble Man. Tim. 42. Tam. *Vellei nangu. Ailiyam.* Mal.

Leaves entire, very glossy and dark above, beneath paler, oblong with a sudden acute point, 8-12 in ;by 3-4 in. Flowers white, clustered on the old branches, about 1 in. across, with a sickly smell. Fruit dark-brown, woody, globose, about 5-6 in. diam., containing from 70-100 seeds.

A handsome, evergreen tree of medium size, common in heavy forest in many parts of Travancore, between 1500 and 3(00 ft. Height 70 ft. Diam. $1\frac{1}{2}$ ft. Endemic. Flowers in March. Fruits March-April, hanging on the tree for a whole year. The wood is grey, soft, and useless but, as it is obtainable in straight lengths, it is sometimes employed for rough huts for temporary occupation.

W.=38 lbs. P.=456.

4. FLACOURTIA. Comm.

Trees usually spinous, with simple, toothed leaves. Flowers diœcious. Sepals 4-5, small, imbricate. Petals none. Stamens numerous. Ovary surrounded by an annular disk 2-8-celled, ovules few. Fruit a pulpy berry.

F. cataphracta. Roxb. Fl. Br. Ind. i. 193. Bedd. Fl. Syl. xvi. Gamble man. Tim. 39. Tam. *Vayankarei* : *charalu*. Mal. *Vayankatha* ; *thalira* ; *kanji*. 32

Leaves 3-7 in. by 1½-3 in. ovate or lanceolate, acuminate, crenate, pale-green, on short petioles. Stem covered with long compound thorns at its base. Flowers white, in short racemes about ⅛ in. across. Fruit a scarlet berry, globose, ⅔ in. diam., containing 8-12 seeds.

A large evergreen tree common in the sub-alpine forests from 0-2500 ft. throughout Travancore. Height 80 ft. Diam. 1½ ft. Occurs also in Bengal, Assam and China. Often cultivated.

Flowers November-February. Fruits February—April.

Bark dark-brown. ⅙ in. thick. Wood purplish-yellow, close-grained, very hard, often knotted and uneven. Pores small, numerous. Rays extremely fine, numerous and close together. Annual rings marked by bands of darker wood plainly seen, about 8 to inch.

W=56 lbs. P=811.

The fruit is acid but edible. The wood is not used.

HYDNOCARPUS. Gœrtn.

Trees with simple, serrate or entire leaves and deciduous stipules. Flowers diœcious, solitary or few together. Sepals 5, imbricate. Petals 5-6, with a large scale. Stamens 5-8. Ovary 1-celled with numerous ovules. Fruit a berry with a hard rind.

Leaves serrate.	Flowers in short fascicles	1. *H. Wightiana*.
Leaves entire.	Flowers on long peduncles	2. *H. alpina*.

1. **H. Wightiana.** Blume. Fl. Br. Ind. i. 196. Bedd. Fl. Syl. xvi. Gamble. Man. Tim. 42. Eng. *Marotti* Tam. *Maravetti*. Mal. *Kodi* ; *nirvetti*. 33

Leaves oblong with a sudden acumination, crenulate, glabrous, 4-9 in. by 1½-4 in. Flowers in short fascicles about 1 in. long or solitary, white, ¼ in. across. Fruit brown, woody and tubercled, globose, 2-4 in. diam. containing 10-20 seeds.

A large, evergreen tree very common throughout Travancore at elevations below 2000 ft. often seen near water, and very commonly planted. Height 100 ft. Diam. 2½ ft. Occurs also in Malabar and in Bombay, But not in Ceylon.

Flowers February to March. Fruits October to December.

Bark pale-brown with white marks, smooth, 1/12 in. thick. Stem often fluted. Wood dull greyish-white, coarse and soft. No heart. Pores very small, numerous and well distributed. Annual rings distinct. Rays fine, very numerous and closely packed.

W. = 36 lbs- P. =464.

The wood is of no use. The seeds yield an oil which is used for lamps, aud medicinally for rheumatism and other complaints. It has also been used in place of Chaulmugra oil for leprosy. (Pharm. Ind. i. 148).

34 2. **H. alpina**. Wight. Fl. Br. Ind. i. 197. Bedd. Fl. Syl. 77. Trimen. Fl Cey. i. 77. Gamble Man. Tim. 42

Leaves entire, drooping dark-green and glossy, lanceolate- $3\frac{1}{2}$--10 in. by 2--4 in. young leaves red. Flowers yellowish-white, nearly 1 in. across, solitary or 2-3 together on long peduncles. Fruit ovoid, tomentose, 3 in. long. Seeds many.

A medium-sized, evergreen tree, not nearly so common as the last, but found throughout Travancore at elevations between 0—2000 ft. Occurs also in the Neilgherries and in Ceylon.

Flowers February to March. Fruits October to December.

Gamble says that the bark is greyish-brown, slightly rough $\frac{1}{4}$ in. thick. Wood light-brown, hard, with streaks of darker colour. Annual rings faint, and he gives

W. = 40 lbs.

Beddome says that the wood is fair, and is used for beams and rafters, and is a good fuel. Growth good, 5 rings per inch.

ORDER VIII PITTOSPOREÆ.

Small trees with alternate, simple, entire, exstipulate leaves. Flowers regular, bisexual. Sepals 5, imbricate. Petals 5, imbricate. Stamens 5, distinct. Ovary 1-celled with 2 parietal placentas. Ovules few or many. Fruit a 2-valved capsule. Seeds few.

PITTOSPORUM. Banks.

Characters of the Order.

Leaves and branches glabrous.	
Flowers umbelled ...	1. *P. tetraspermum.*
Flowers in racemes	2. *P. Nilghirense.*
Leaves and branches tomentose	3. *P. dasycaulon.*

35 1. **P. tetraspermum.** W. and A. Fl. Br. I. i. 198. Beddome Fl. Syl. xvii. Trimen Fl. Cey. i. 77. Gamble Man. Tim. 43. Mal. *Kachapatta*

Leaves elliptic, acute, $1\frac{1}{2}$-4 in. by $\frac{2}{3}$-2 in. shining above, pale below, coriaceous. Umbels sessile. Flowers $\frac{1}{2}$ in. long, yellow-green. Stigma 2-lobed. Capsule globose. $\frac{3}{8}$ in. with flat valves. Seeds 4.

A small tree found in evergreen forest on the High Range, at an elevation of 5000 and upwards. Occurs also in the Neilgherries and in Ceylon. Wood unknown.

Flowers in February to March. Gamble gives

W. = 48 lbs.

36 **P. nilghirense.** W. and A. Fl. Br. I. i. 198. Beddome Fl. Syl. xvii. Gamble Man. Tim. 43.

Leaves ellipitc, acute, 1-4 in. by $\frac{1}{2}$-2 in., shining above, pale below, coriaceous. Racemes 2-3 together, 1-4-flowers. Sepals minute. Petals linear. Stigma 2-lobed. Capsule yellowish-green, 2-valved, 4-6-seeded.

A small tree common in the evergreen forests from 3000 ft. upwards, throughout Travancore Wood unknown. Occurs also on the Neilgherries

Flowers Febuary to March Fruits May to June.

3. **P. dasycaulon** Miquel. Fl. Br. I. i. 199. Gamble Man. 37
Tim. 43.

Leaves glabrous above, downy beneath elliptic, $2\frac{1}{2}$-4 in. by 1-$1\frac{1}{2}$ in. Petiole $\frac{1}{2}$ in. Branchlets tomentose. Flowers white, about $\frac{1}{4}$ in. long, downy. Petals glabrous, sepals and peduncles softly tomentose Anthers bright-yellow, Capsule $\frac{1}{2}$ in. long, apiculate, compressed, containing 5 or 6 seeds.

A small tree up to 30 ft. high and 10 in. diameter, found on the Peermade Ghat at 3000 ft. elevation. Occurs also in Canara and the Western Ghats. Bark $\frac{1}{6}$ in thick, grey, covered with lenticels. Wood pale yellowish-brown, smooth and close-grained, very hard. Pores very small, few. Rays very numerous, moderately broad and conspicuous.

W=49 lbs. P=711.

Flowers and fruits together in Jannuary-February.

ORDER IX. POLYGALEÆ.

Small trees with alternate, simple, entire, exstipulate leaves. Flowers irregular, bisexual. Sepals 5, unequal, imbricate. Petals 3 or 5, unequal. Stamens 8. Anthers opening by terminal pores. Ovary free, 1-celled. Ovules 1 or more in each cell. Fruit 1-seeded.

XANTHOPHYLLUM. Roxb.

Flowers in racemes. Ovary stipitate. Ovules 4. Fruit indehiscent. Seed globose.

X. flavescens. Roxb. Fl. Br. I. i. 209. Beddome Fl. Sy. 38
xix. (Under *X. angustifolium*). Trimen Fl. Cey. i. 84. Gamble Man. Tim. 45. Tam. *Muttei*. Mal. *Madakha: mottal*.

Leaves very glossy, dark-green above, yellowish beneath, ovate-lanceolate, 2-6 in. by 1-3 in. Flowers in axillary racemes, yellowish-white, $\frac{1}{3}$-$\frac{1}{2}$ in. long. Ovary globose. Ovules 4, 2 erect and 2 pendulous. Fruit globose, dark-green, $\frac{1}{2}$-$\frac{3}{4}$ in. diam, thick-skinned.

A small tree, extremely common in all evergreen forests from sea level up to 4000 ft., with very dense foliage. Height 20 ft. Diameter 8 in. Almost constantly in flower. Fruits in July-August and at other times. Occurs through India and Ceylon.

Bark dark-green, smooth, $\frac{1}{2}$ in. thick. Wood moderately hard, yellow tinged with grey, close-grained and uniform. Pores medium, irregularly distributed. Rays very fine and numerous. Annual rings marked by narrow bands of darker wood about 18 to inch.

W=48 lbs. P=567.

The wood is not used.

ORDER X GUTTIFERÆ.

Trees abounding in yellow or greenish juice. Leaves simple, opposite, entire, exstipulate. Flowers regular, bisexual or polygamo-diœ ls 4, white, yellow or red. Sepals 4-5, imbricate persistent. Pèta ed -8, imbricate, distinct. Stamens indefinite, in female flowers reduc to staminodes. Ovary 1-many-celled, with 1-4 ovules in each cell. Fruit usually indehiscent. Seeds large.

This Order is well represented in our forests, and the species occurring include the "Iron wood" *Mesua ferrea*, the "Poon spar" or "Punna" tree *Calophyllum elatum*, the "Puthankolli" *Pœciloneuron indicum*, and several species of gamboge (*Garcinia*). The gamboge of commerce is obtained from *G. Hanburii* a Siamese tree, and from *G. Morella* which we have. The famous "Mangosteen" fruit is procured from *G. Mangostana*, a tree indigenous in the Malaya Peninsula, and now introduced into India and Travancore, where it bears well. The American "Mammee" apple is the produce of *Mammea americana*, while another tree of this Order is the *Pentadesma butyracea*, "the Tallow" tree of Sierra Leone.

Ovary-cells 1-ovuled. Stigma sessile . . 1. *Garcinia.*
Ovary-cells with 1—2 or 4 ovules. Style slender.
    Ovary 1-celled, 1-ovuled. Style 1, stigma peltate . . 2. *Calophyllum.*
    Ovary 2-celled, 4-ovuled. Style 1, stigma peltate . . 3. *Mesua.*
    Ovary 2-celled, 4 ovuled. Styles 2, stigmas acute . . 4. *Pœciloneuron.*

1. GARCINIA. Linn.

Leaves thick, smooth. Flowers polygamo-diœcious. Sepals 4-5. Petals 4-5, imbricate. Male flowers, stamens, 10-many. Female flowers, staminodes 10-30. Ovary 2-12-celled, with 1 ovule in each cell. Stigma sessile, peltate. Fruit fleshy, few seeded. Seeds large.

Sepals and petals 4. Stamens monadelphous
  Stigma lobed.
    Fruit deeply grooved . . 1. *G. Cambogia.*
    Fruit tuberculate . . 2. *G. echinocarpa*
    Fruit smooth. Leaves over 1 in broad . . 3. *G. Morella.*
    Fruit smooth Leaves less than 1 in. broad . . 4. *G. Wightii.*
  Stigma entire . . 5. *G. Imberti*
Sepals and petals 4. Stamens in 4 bundles . . 6. *G. travancorica.*
Sepals and petals 5. Stamens in 5 bundles
    Leaves exceeding 9 in. long. Ovary pointed . . 7. *G. Xanthochymus*
    Leaves less than 9 in. long Ovary globose . . 8. *G. ovalifolius.*

39 1. **G. Cambogia**, Desrouss. Fl. Br. I i. 261. Beddome Fl. Syl. t. 85. Trimen Fl. Cey. i 95. Gamble Man. Tim. 54. Tam. *Kodakkapuli.* Mal. *Kodapuli : pinaru : penanga.*

Leaves elliptic, dark-green, shining, 2-5 in. by 1-2 in. yellow beneath, narrowed to the base. Petiole ½ in. Flowers fleshy, yellowish-white. Male 4 to 12 together, in simple umbels from the axils

of fallen leaves, about $\frac{3}{4}$ in long: stamens 10-20 together forming a central globular head. Female larger, 1-3 together from the axils of the terminal pair of leaves: staminodes 10-20 in. a ring round ovary Stigma 7-12-rayed. Fruit globose, pale-yellow, fleshy, deeply grooved, about 3 in. diam. Grooves about 8 or 10. Seeds about 8.

A very common, evergreen tree found in all our forests up to 6,000 ft and also planted in compounds. Height 80 ft. Diam 2 ft. Juice pale-yellow. Occurs also in Malabar and Ceylon.

Flowers February to March. Fruits July to August.

Bark almost black, rough, $\frac{1}{6}$ in thick. Wood moderately hard. pale-grey, uniform, close-grained, liable to be bored by beetles No heart. Pores small and evenly distributed. Rays very fine and close, crossed by transverse bands. Annual rings marked by bands or darker wood, about 15 to the inch.

W. = 47 lbs. P. = 608.

The fruit is eaten raw and pickled. It is very acid. The timber is not used. Thwaites says that the gum is soluble in spirits of turpentine, but not in water. It yields a beautiful varnish.

2. **G. echinocarpa.** Thwaites Fl. Br. I. i. 264. Beddome Fl. Syl. xxi. Trimen Fl. Cey. i 96. Gamble Man. Tim. 53. Mal. *Púra.* 40

Leavss ovate, very succulent, closely veined, 3-5 in. by 2-3 in. Petiole $\frac{1}{2}$-1 in. very stout, clasping the branch. Flowers very fleshy, with red sepals and green petals, about $\frac{3}{4}$ in long, male in clusters 2-12 together, female solitary, all sessile and terminal. Stamens about 80 together. in a globose, central mass. Staminodes in female flowers 24-30, in a ring round the ovary. Ovary 4-celled, covered with scales. Fruit ovoid, green- $1\frac{1}{2}$-$2\frac{1}{2}$ in by 1-2 in. covered with tubercles, containing 1-4 large, brown seeds.

A very handsome, evergreen tree confined with us to the moist forests of South Travancore, between 3,000 and 5,000 ft. Height 70 ft. Diam. 2 ft. Juice cream-coloured. Occurs also in Ceylon.

Flowers March to April. Fruits December to March.

Bark mottled green, red, yellow and white, $\frac{1}{4}$ in. thick, smooth, inner bark deep-red. Wood bright reddish-brown, prettily streaked, very hard. No heart. Pores medium to small, scanty, evenly distributed. Rays broad and fine at varying distances, well-marked, crossed by pale, wavy, concentric bands of tissue. Annual rings not distinct.

W = 56 lbs. P = 955.

No use is made of any part of the tree on account of its rarity, but in Ceylon the timber is used largely and it looks a first class wood. An oil is obtained from the seeds.

3. **G. Morella.** Desrouss. Fl. Br. I. i. 264. Beddome Fl. Syl. t. 86. Trimen Fl. Cey. i. 96. Gamble Man. Tim. 55. Eng. "*Gamboge tree.*" Tam. *Makki.* Mal. *Ohigiri.* 41

Leaves elliptic-obovate, obtuse, base acute, closely veined, glabrous 3-4½ in. by 1½-2 in. Petiole ⅓-½ in. Flowers sessile in the axils of fallen leaves, reddish, succulent, about ¼ in long. Male 2 or 3 together. Female solitary. Petals longer than sepals. Stamens monadelphous, about 12 in a column, free above. Staminodes in female flowers about 12, in a ring round the ovary. Ovary globose, smooth, 4-celled. Fruit globose ¾ in. diam, reddish-white, quite smooth, crowned with the stigma, containing 1-4 ovoid, brown seeds.

A medium-sized tree of the evergreen forests, found at low elevations in S. Travancore. Foliage dark and thick. Local but not common. Height 40 ft. Diam. 1 ft. Occurs in Bengal, Malabar, Ceylon, Malacca, and Siam.

Flowers in January. Fruits April to June.

Bark brown, smooth, ¼ in. thick. Wood greyish-yellow, fairly smooth, very hard. No heart. Pores numerous, medium, often divided, evenly distributed. Rays of medium width rather close, crossed by wavy lines of pale tissue. Annual rings marked by dark lines without pores, about 10 to inch.

W.=43 lbs. P.=772.

The wood is not used, as, though hard it is liable to split. A beautiful pigment exudes from the tree, but it does not seem to be collected in Travancore. This species produces the true gamboge of medicine and arts. The chief trade supply is obtained from Siam in the form of cylinders 1-2 in diam. The gum is a valuable medicine as well as one of the commonest pigments used in painting. Its value is about Re. 1 as 4 per lb. The seeds yield an illuminating oil. (Dict. Econ. Prod.)

42 4. **G. Wightii** T. Anders. Fl. Br. I. i. 265. Gamble Man. Tim. 55. Mal. *Puli maranga.*

Leaves pale-yellow when young, dark-green when old, very glossy, lanceolate, acuminate, 3-4 in. by ½-¾ in. Petiole ¼ in. Flowers, yellow, fleshy, sessile in the axils of the old leaves, about ⅓ in. long, male singly or in pairs, female solitary. Petals and sepals equal. Stamens 18-20 on a column, anthers reddish peltate. Fruit a 4-celled berry, globose, ¾ in. diam, pale-green, smooth, containing 4 seeds.

A small tree common along the banks of the Periyaur from sea level to 2,000 ft. but I have seen it nowhere else. Height 25 ft. Diam. 9 in.° Endemic.

Flowers in December. Fruits in February.

Bark brown, rough, ⅙ in. thick. Wood white, moderately hard, close-grained, polishes well, but warps badly, crossed by narrow concentric bands of light tissue. No heart wood. Pores small. Rays fine to moderately broad, long and scanty.

W.=63 lbs. P.=713.

The juice of this tree is bright yellow and said to be soluble and to yield a good pigment.

5. **G. Imberti.** Bourdillon. Journal Bomb. Nat. His. Soc. xii. 349. Gamble Man. Tim. 51. Tam. *Manja kanji*. 43

Leaves glossy, dark-green, lanceolate, acuminate, narrowed to the base, 2-3½ in. by ½-1½ in. Petiole ⅛ in. Flowers yelow, fleshy, ⅙-¼ in across, sessile, terminal, male at the end of branchlets. 3, 6 or 9 together. Female solitary or in pairs. Stamens 16-20 in a column. Stigma broad, entire. Staminodes 16-20 in a ring round the ovary. Ovary 2-celled. Fruit green, 1 in. long and broad and ½ in. thick 1 or 2-seeded.

A medium-sized tree, fairly common in the evergreen forests of S. Travancore above 3000 ft. but local. Height 40 ft. Diam. 1 ft. Endemic. The juice is pale-yellow, sticky and resinous, rather fragrant.

Flowers April—May. Fruits August—September.

Bark rather rough, brown, cracked vertically, ¼ in. thick. Wood grey with whitish patches through it, very hard, but apt to split. No heart. Pores sometimes divided, medium to small, rather scanty, evenly distributed. Rays fine and rather broad, crossed by numerous, concentric, wavy bands of pale tissue. Annual rings not seen.

W. = 56 lbs. P. = 690.

The timber is not used.

6. **G. travancorica.** Bedd. Fl. Br. I. i. 268. Bedd. Fl. Syl. t. 173. Gamble Man. Tim. 52. 44

Leaves linear-oblong, tip rounded, base acute, coriaceous, very finely reticulated, 2-4 in. by ½-1 in., dark-green and shining above, pale beneath. Petiole ½ in. Flowers white, succulent, about ½ in. across, terminal. Male 3 together, female solitary. Sepals unequal. Petals about twice their size. Stamens numerous in 4 masses. Staminodes few, slender. Ovary globose, with a very large stigma, 4-celled. Fruit oblong, flattened, 1½-2 in., by ½-1 in., green smooth, containing 1 or 2 bright, brown seeds.

A medium-sized tree of the evergreen forests above 3,500 ft. in South Travancore only. Common, but very local. A very ornamental tree. Height 50 ft. Diameter 1 ft. Endemic in Travancore and Tinnevelly.

Flowers in September—October. Fruits February—May.

Bark brown, rather rough, ¼ in. thick. Wood yellowish-white with a small patch of bright, brown heartwood, streaked with lines of darker colour, very hard, smooth, but liable to crack. Pores small, scanty, arranged in concentric lines. Rays fine to broad, crossed by wavy bands of light tissue, well marked, and showing a silver grain on a radial section. Annual rings indistinct.

W. = 58 lbs. P. = 533.

The wood is brittle and is not in use. Beddome says "Every portion of the tree yields an abundance of bright, yellow gamboge." This is a mistake. The sap is colourless, thin, sticky and resinous, and would be of no use as a pigment.

45 7. G. **Xanthochymus**. Hook f. Fl. Br. Ind. i. 269. Gamble Man. Tim. 50. Bedd. Fl. Syl. t. 88 (under *Xanthochymus pictorius*) Mal. *Ana vaya*.

Leaves oblong, tapering to both ends, very glabrous, dark-green and shining above, yellowish beneath, 9-14 in. by 2-4 in. Petioles 1 in., dilated near their insertion on the branches. Branchlets 4-angled. Flowers white, $\frac{3}{4}$ in across, male in 4-8-flowered fascicles, female solitary. Stamens in 5 broad bundles of 3-7 each. Anthers in hermaphrodite flowers 10—15. Ovary ovoid, pointed, 5-celled. Stigmas 5, spreading. Fruit 2 in diameter, globose, smooth, yellow, containing 5 large seeds.

A handsome tree with drooping branches, only seen by me in the North of Travancore in evergreen forest at an elevation of 3,500 ft. where it was common. Height 50 ft. Diameter 1 ft. Occurs also in Coorg, on the West Coast, in Bombay, Bengal, Penang and Burmah.

Flowers in April—May. Fruits in November—December.

Bark brown, $\frac{1}{4}$ in. thick. Gamble says that the wood is dark greyish-brown, very hard and close-grained, concentric bands thin, white, numerous. Pores very scanty, moderate-sized, and unevenly distributed. Rays fine, white, numerous but irregular and that the wood is strong and good. The fruit is very acid, but is sometimes eaten in curries. The bark is used as a dye in Assam.

W = 57 lbs.

No use is made of the tree or its products in Travancore.

46 8. G. **ovalifolia**. Hook f. Fl. Br. Ind. i. 269. Bedd. Fl. Syl. xxi. (under *Xanthochymus ovalifolius*). Trimen Fl. Cey. i. 98 Gamble Man Tim. 50 (under *G. spicata*) Mal. *Manja nangu*.

Leaves very glabrous, broadly oval, rounded at the base, thick and leathery, 3-6 in. by 2-3 in. Petiole $\frac{1}{2}$ in. Flowers white, in the axils of fallen leaves, $\frac{1}{2}$ in across, both male and female in fascicles, the former more numerous. Stamens in 5 long-clawed fascicles, 5-10 in. each. Staminodes 5. Ovary globose with a 3-5-lobed stigma. Fruit ovoid, acute, smooth, $1\frac{1}{2}$ in long with 1-3 brown seeds.

An elegant, evergreen tree with horizontal branches, only seen by me in the forests round Kulathurpuzha at 200 ft. elevation. Height 80 ft. Diameter $1\frac{1}{2}$ ft. Occurs also on the West Coast, in Ceylon and Cochin China, and is cultivated there.

Flowers in January. Fruits in June—July.

Bark brown, $\frac{1}{4}$ in. thick. Wood yellowish-white, hard close-grained with numerous concentric bands. Pores few, medium, Rays fine, numerous and long. No heartwood.

W. = 62 lbs. P. = 942.

The wood is unknown and the gum is of no value, being sticky and pale. Trimen says that the pulp of the fruit, when young, affords a chrome-yellow pigment.

2. CALOPHYLLUM Linn.

Trees with thick leaves having very numerous, straight veins, close and parallel. Flowers bisexual. Sepals 4 in two rows, imbricate. Petals 4, imbricate, or 0. Stamens numerous, free or connate at the base. Ovary 1-celled with one erect ovule. Fruit a drupe.

Petals 4. Fruit exceeding ½ in. long.	
Racemes shorter than leaves.	
Young parts glabrous ..	.. 1. *C. inophyllum.*
Young parts tomentose ..	.. 2. *C. tomentosum.*
Racemes longer than leaves ..	.. 3. *C. trapezifolium.*
Petals 0. Fruit less than ½ in. long.	.. 4. *C. Wightianum.*

1. **C. inophyllum** Linn. Fl. Br. Ind. i. 273. Bedd. Fl. Syl. xxii. Trimen Fl. Cey. i. 100. Gamble Man. Tim. 57. Eng. *Alexandrian laurel.* Tam. *Pinnei.* Mal. *Punna.* 47

Leaves oblong-oval, acute at base, smooth and shining, 4-8 in. by 3-4 in. Petiole ½-1 in. Flowers white, fragrant, 1 in. across, in axillary racemes 4-6 in. long. Sepals and petals alike, 4 each. Stamens connate at base into 4 or 6 bundles. Style long, twisted. Drupe globose, smooth, green, 1½ in. dim.

A moderate-sized tree commonly planted and run wild in the low country throughout Travancore, especially near water, but possibly not indigenous. Height 50 ft. Diam. 1½ ft. Occurs also on the West Coast, in Ceylon, Burmah, Malaya, Africa and Australia, and everywhere cultivated.

Flowers in March-April. Fruits in May-June, but flowers and fruits are found at other seasons, as the tree has one large and two small crops every year.

Bark blackish-brown, smooth. Wood reddish brown, moderately hard, close-grained. Pores of medium size, arranged in groups or lines. Rays very fine and numerous.

W. = 43 lbs. P. = 318.

The tree is planted along road-sides for shade, and in gardens for ornament. The wood is valued for its elasticity. An oil for lamps is extracted from the seeds, the fruit being offered for sale in the bazaars. The oil from the seeds and the gum are used medicinally. (Dict. Econ. Prod.)

2. **C. elatum.** Wight. Fl. Br. Ind. i. 213. Trimen Fl. Cey. i. 101. Beddome Fl. Syl. t 2 (under *C elatum*) Tam. *Kátta pinnei.* Mal. *Kátta pinna: pinnapai.* 48

Leaves oblong, very glossy and dark-green, smooth, 4-5 in. by 1½-2 in. Petiole ½-1 in. Flowers white, fragrant, ¾ in. across in lax, axillary and terminal panicles. Sepals and petals 4 each. Fruit ovoid, smooth, apiculate, dark purple, about 1 in. long.

A very lofty, straight tree, unbranched for a great height, with deeply cracked, yellow bark, very common at elevations from 1000-5000 ft. through Travancore, especially on clayey soil. Height 120 ft. Diam. 4 ft. Found on the West Coast from Canara to Cape Comorin, and in Ceylon.

Flowers in March-April. Fruits in May-June

Bark yellow, $\frac{3}{8}$ in. thick. Wood reddish-pink, streaked and marked with darker colour, rough and coarse, moderately hard. No heart-wood, but the inner wood is darker in colour. Pores large, scanty, arranged in wavy lines running towards the circumference. Rays very fine and numerous. Annual rings marked by dark lines, 8-10 to in., in one specimen, 2-4 in. another.

W.=38 lbs. P.=532.

This tree yields the 'Poon spar' of commerce. It has been selected for this purpose because of its long, straight fibre and its elasticity, and because long spars can be obtained. The demand for masts is very uncertain, in fact there seems to be no regular demand, but when a mast is required at Cochin or elsewhre on the coast, a tree is cut down and a suitable log is worked down. Though the tree is common it is not gregarious, and therefore it is unlikely that any trade in this tree will spring up. The timber has been used for shingles, but they do not last, and white-ants eat it A lamp-oil is obtained from the kernel of the fruit. The Peermerd tree which has very narrow leaves and grey bark may be different. The Mannans call it Karanaguthiyam and say that the fruit is edible.

49 3. **C. trapezifolium**. Thwaites. Fl. Br. Ind. i. 275. Bedd. Fl. Syl. xxii. Trimen Fl. Cey. i. 103.

Leaves obovate, rounded at the apex, tapering to the base, 1-$1\frac{1}{2}$ in. by $\frac{1}{2}$-$\frac{3}{4}$ in. coriaceous, dark-green and glossy. Petiole $\frac{1}{3}$ in. Flowers white, 1 in. across, in few-flowered, axillary racemes exceeding the leaves. Sepals and petals 4 each. Fruit purple, ovoid, pointed smooth. $\frac{3}{4}$ in. long, on long peduncles.

A tree of medium size found by me near the Travancore-Tinnevelly boundary at Chimunji, at an elevation of about 4000 ft. Height 30 ft. Diam. 1 ft. Occurs also in Ceylon.

Flowers in Nov.—Dec. Fruits in May—June.

Nothing is known of the timber of this tree or its uses.

50 4. **C. Wightianum** Wall. Fl. Br. Ind. i. 274, Bedd. Fl. Syl. t. 90, Gamble Man. Tim. 58. Mal. *Cherupunna: áttappunna: pora-punna: manja punna.*

Leaves ovate-oblong, coriaceous, very glossy, 2-3 in. by $1\frac{1}{2}$-2 in. Petiole $\frac{1}{4}$ in. Flowers white, $\frac{1}{2}$ in. across, in axillary, spreading panicles, about 2 in. long, generally shorter than the leaves. Sepals 4, unequal. Petals 0. Fruit ovoid, green, $\frac{3}{8}$-$\frac{1}{2}$ in. long on $\frac{1}{2}$ in. pedicels, 3-6 together.

A tree of Medium size common on the banks of rivers and back-waters, at elevations up to 1000 ft. Height 70 ft. Diam. 2 ft. Confined to the West Coast, from the Concan to Cape Comorin.

Flowers in October—November. Fruits in December—January.

Bark yellowish-brown, $\frac{3}{4}$ in. thick, deeply cracked, wood reddish-brown, mottled, rather rough, with a long fibre, moderately hard. No heart. Pores large and medium-sized, arranged in short radial lines often bent, and evenly distributed. Rays extremely fine and close together. Annual rings marked by thin, dark lines without pores, about 8 to the inch.

W.=44 lbs. P.=579.

The timber is used for furniture and house-building. The seeds are largely collected for the purpose of extracting a lamp-oil. Our tree may prove to be a distinct spacies. (Brandis Ind Tr. 55.)

3. MESUA. Linn.

Trees with glossy leaves, having very numerous but inconspicuous lateral veins. Flowers axillary, bisexual. Sepals and petals 4 each, imbricate. Stamens very numerous, distinct, anthers dehiscing vertically. Ovary 2-celled with 2 ovules in each. Style long. Fruit woody, 2-valved, containing 1-4 seeds.

M. **ferrea**. Linn. Fl. Br. Ind. i. 277. Bedd. Fl. Syl. xxiii 51
and t. 64 (*M. coromandelina*). Trimen Fl. Cey. i. 105. Gamble Man. Tim. 59. Eng. *Iron wood*. Tam. *Nangu* Mal. *Nanga: vellattha pila: peri.*

Leaves very variable in size and shape, lanceolate or ovate, 2-6 in. by $\frac{3}{4}$-2 in. coriaceous, covered with white powder beneath, bright-red when young, dark-green when mature. Petiole $\frac{1}{3}$ in. Flowers white, very fragrant, 1-4 in. across, 1-3 together, sub-sessile. Fruit ovoid, pale-green turning brown, 1-$2\frac{1}{2}$ in. diam. Seeds $\frac{2}{3}$ in. long, flattened on one side, dark-brown.

A medium-sized or very lofty and handsome, evergreen tree, generally buttressed, abundant at all elevations in the forests of Travancore. Height 40-100 ft. Diam. 1-4 ft. Occurs through India and Ceylon.

The Hillmen recognize 3 varieties of this tree which they call,

1. *Tadi nangu* or *Karu nangu*, a small tree with very hard wood, broad leaves, and small flowers and fruit. It is found only on the hills.

2. *Manni nangu* a medium-sized tree, with a less hard wood, larger flowers and small leaves. It is found only at the low elevations.

3. *Nir nangu* a very large tree, with a wood less hard than the others, long narrow leaves and large flowers. It is found both on the hills and at the low elevations.

These respectively correspond to the *M. ferrea*. *M. coromandelina* and *M. speciosa* of Beddome, which he considers to be distinct species, but which are treated as varieties of the same species in the Fl. Br. Ind.

Flowers January—April. Fruits October—March.

Bark $\frac{1}{3}$ in. thick, pale-brown, scaling off. Heartwood red, streaked, with lines of darker red, extremely hard and close-grained with a very long fibre. Sapwood yellowish-white. Pores medium-sized, few, often arranged in oblique lines. Rays extremely fine and very numerous, crossed by fine, wavy concentric lines of lighter tissue. Annual rings not seen.

My experiments gave W. = 60 lbs. P. = 951, but Gamble considers this weight too low, and as this timber is certainly heavier than that

.. *Hopea parviflora* and *Terminalia tomentosa*, I agree. My specimens may have been taken from immature trees. We may therefore take

W. = 69 lbs. P. = 1020.

The nangu is always classed as one of our best timbers, but nevertheless it is very little used, and there is no demand for it. This appears to arise from the difficulty of sawing the logs. Sawyers who will not mind sawing *Hopea parviflora* and *Terminalia tomentosa*, demand treble rates for this wood. Further, it is a curious fact that nangu is very frequently riddled by some kind of borer, which runs large tunnels through it big enough to admit a finger. This very much disfigures and weakens the timber. It is used for buildings, but, as Gamble says, "The timber is very strong, hard and heavy "and it is just its weight and hardness, and the difficulty of extract-"ing it from the forest and converting it, that lead to its comparat-"ively little use".

For fuel nangu is the very best of all woods, and gives out a great heat. The tree yields a cream-coloured, aromatic resin. A useful oil is obtained from the seeds, while the "dried blossoms are prescribed by Hindu physicians as an adjunct to medicinal oil". (Pharm. Ind. i. 170.) Young trees make capital walking sticks.

4. POECILONEURON. Bedd.

Trees with coriaceous, reticulate leaves. Flowers bisexual. Sepals 4-5, imbricate, Petals 5-6, contorted. Stamens numerous, free or slightly connate with subsessile anthers. Ovary 2-celled with 2 ovules in each cell. Styles 2. Fruit a 2-valved capsule.

Flowers in a panicle.	Sepals and petals 5 each	...	1. *P. indicum.*
Flowers 1-4 together.	Sepals 4: petals 6	...	2. *P. pauciflorum*

52 1. **P. indicum** Bedd. Fl. Br. Ind, i. 278. Bedd. Fl. Syl. t. 3. Gamble Man. Tim. 61. Tam. *Púthangkolli.* Mal *Vayila.*

Leaves very glossy, dark-green, lanceolate, 4-8 in. by 1-2½ in. Petiole 1½ in. Flowers white, fragrant, ¾ in. across, in axillary and terminal panicles. Sepals and petals 5. Stamens about 20, with lobed anthers. Capsule globose, beaked. about 1 in. diam., containing one fleshy seed.

A large, evergreen tree generally to be found in clumps growing on wind-blown ridges, common in South Travancore at elevations from 1000-3000 ft. less common in the North. Height 90 ft. Diam. 2½ ft. Found along the Western Ghauts as far North as S. Canara, and in Tinnevelly. It seeds freely and reproduces well, and merits attention.

Flowers from December—April. Fruits July—August.

Bark grey, rough, ½ in. thick. Wood dark reddish-brown, heartwood darker, very hard, sapwood pale. Pores of medium size,

usually arranged in short lines. Rays fine and numerous, crossed occasionally by white concentric lines.

W. = 60 lbs. P. = 928.

This tree yields a very excellent wood which is much used by Tea planters for house and bridge-building. If sawn into planks it is apt to crack, but for beams and joints nothing could be better. Owing to its being found only on the hills, the timber is not brought to the low country for sale. It makes excellent rice-pounders and walking-sticks, and it burns well.

2. **P. pauciflorum**. Bedd. Fl. Br. Ind. i. 278. Bedd. Fl. Syl. t. 98. Gamble Man. Tim. 61. Tam. *Púthangkolli*. Mal. *Puli vayila*. 53

Leaves lanceolate with a blunt accumination, narrowed to the base, glabrous, 5-6 in. by 1-1½ in. Petiole ⅓ in. Flowers white, ½ in. across, solitary at the axils, or 3-4 together and terminal. Sepals 4, unequal. Petals 6. Stamens about 20 with simple anthers. Capsule ovoid, about 1 in. long and ½ in. diam.

A large evergreen tree found by me in N. Travancore only, but said by Beddome to be "abundant on banks of rivers in South Tinnevelly and Travancore up to 4000 ft." Height 60 ft. Diam. 2 ft. Confined to these two Districts.

Beddome says that it "yields a valuable, hard, reddish timber, "which is used for building and other purposes, and for walking sticks." It is not used in Travancore.

Order XI. TERNSTROEMIACEAE.

Leaves simple, alternate, exstipulate. Flowers regular, bracteate, bisexual or dioecious. Sepals usually 5, imbricate. Petals 5, imbricate or contorted, often united at the base. Stamens 5-30. Ovary 2-5-celled with numerous ovules, or 1 or 2 in. each cell. Styles connate. Fruit indehiscent or capsular.

A small Order represented in Travancore by three trees, all found in the hilly region, none of them of large size or of any value. The cultivated tea-plant *Camellia Thea*, Linn, belongs to this Order.

Fruit indehiscent. Anthers basifixed. Sepals equal
  Flowers bisexual ... ... 1. *Ternstroemia*.
  Flowers dioecious ... ... 2. *Eurya*.
Fruit dehiscent. Anthers versatile. Sepals unequal ... 3. *Gordonia*.

1. TERNSTROEMIA. Linn.

Trees with leathery, entire leaves, and axillary flowers. Sepals and petals 5. Stamens numerous. Ovary 2-celled with 1-2 ovules in each cell. Fruit 2-4-seeded with large seeds.

T. japonica. Thunb. Fl. Br. Ind. i. 280. Trimen Fl. Cey. i. 107. Gamble Man. Tim. 62. Bedd. Fl. Syl. t. 91 (under *T. gymnanthera*). 54

Leaves 2-3 in. by $\frac{3}{4}$-1$\frac{1}{2}$ in. lanceolate or oval, narrowed to the base. Petiole $\frac{1}{4}$ in, stout, red. Flowers greenish-yellow, $\frac{1}{3}$ in, across borne singly in the axils of fallen leaves on $\frac{1}{2}$ in. peduncles. Fruit ovoid. fleshy, brown, $\frac{3}{4}$ in. long.

A much branched, evergreen tree of moderate size, common above 3,000 ft. through Travancore. Height 40 ft. Diameter 1 ft. Occurs also in Ceylon, South India, Bengal, China and Japan.

Flowers in April. Fruits in October-November.

Gamble says that "the bark is brown, $\frac{1}{2}$ in. thick, smooth, or "tesselated. Wood reddish-brown, moderately hard, smooth and "even-grained. Pores small and numerous. Rays of two kinds., ,,broad and fine. Growth slow, 8 to 10 rings per inch."

"W=40 lbs."

"The wood is good for building, but requires careful seasoning."

2. EURYA. Thunb.

Small trees with glabrous, serrate leaves. Flowers axillary and small. Sepals 5. Petals 5, imbricate, united at the base. Stamens 5-20. Ovary 3 celled with several ovules in each cell. Styles 3. Fruit a dry berry.

55 **E. japonica** Thunb. Fl. Br. ind. i. 284. Bedd. Fl. Syl. t. 92 Brandis For. Fl. 24. Trimen Fl. Cey. i. 109. Gamble Man. Tim. 63.

Leaves lanceolate, acuminate, 2-4 in. by $\frac{3}{4}$-1 in. sub-sessile. Flowers $\frac{1}{6}$ in. across, white 1 to 3 together on short peduncles. Fruit globose, $\frac{1}{6}$ in. diameter, crowned with the persistent style.

A small tree or large shrub, up to 30 ft. high and 1 ft. diameter, common on all the hills at elevations of 2,000 ft. and upwards. Found also in Ceylon, through India and in China, Japan and Java.

Flowers April-September. Fruits May-October.

Bark thin, grey-brown. Wood brown, soft and close-grained. Pores few and small. Pores fine and broad, very numerous. (Gamble).

W.=45 lbs.

Sometimes called wild tea, from its resemblance to the cultivated plant. Useful for fuel.

3. GORDONIA, Ellis.

Trees of medium size with crenate leaves. Flowers large, solitary and axillary, bisexual. Sepals 3-5 unequal. Petals cohering at the base. Stamens numerous. Ovary 3-5 celled with several ovules in each cell. Fruit a 5-angled capsule, containing numerous compressed seeds.

56 **G. obtusa**, Wall. Fl. Br. Ind. i. 291. Bedd. Fl. Syl. t. 83. Gamble. Man. Tim. 67.

Leaves lanceolate, pale-green, with marked venation, 3-5 in. by 1-2 in. Petiole $1\frac{3}{4}$ in. Flowers white, 2 in. across. Capsule erect, brown, $1\text{-}1\frac{1}{2}$ in. long by $\frac{1}{2}$ in. thick.

A medium-sized tree of the evergreen forests, common throughout Travancore at elevations between 2000 and 4000 ft. Height 60 ft. Diam. 2 ft. Occurs only in South India.

Flowers October-November and March. Fruits May-June.

The bark is smooth, grey and $\frac{1}{4}$ in. thick. The wood is pale reddish-brown, very elastic, hard, close-grained, and polishes well. Pores extremely small and numerous. Rays very fine. Rings indistinct, about 15 to the inch.

W.=40 lbs. P.=533.

The wood is not used. It is said to warp. The leaves have been used on the Neilgherries as a substitute for tea.

ORDER XII. DIPTEROCARPEAE.

Resinous trees with alternate, simple, entire, stipulate leaves: lateral nerves parallel. Flowers regular, bisexual, in racemes or panicles, Calyx 5-lobed. Petals 5. usually, connate at the base. contorted. Stamens 15 or many, Connective often produced into a bristle. Ovary 3-celled with 2 ovules in each cell. Fruit a one-seeded nut, often winged.

A most important Order containing 10 trees indigenous in Travancore, most of which are of large size and great value on account of their timber. Gamble remarks "Besides being valuable as timber "trees, most Dipterocarps abound in resin or wood-oil. On this "Brandis says, Dipterocarps form resinous substances on a large scale "in their leaves and deposit them in their wood. In the living tissue "these substances are in liquid, oily condition; while in the old wood "solid or crystalline masses are deposited".

To this Order belongs the camphor tree of Borneo and Sumatra *Dryobalanops aromatica* a huge tree from which camphor-wood boxes are made.

Sepals combined below into a tube. Stipules large.
  Calyx enlarged in fruit, wings 2 . . 1. *Dipterocarpus.*
Sepals slightly connate, not combined into a tube. Stipules small.
  Calyx enlarged in fruit, segments erect. Stamens 15.
    Fruit sepals unequal, wings 2 . . 2. *Hopea.*
    Fruit sepals equal, not winged.

NOTE—In his "Enumeration of the Dipterocarpeæ" published in Vol. XXXI of the Journal of the Linnean Society, Sir D. Brandis refers to two peculiarities common in this Order, (1) the habit of certain species of growing erect without branching till they have attained a great height. and (2) the tendency of many species to become gregarious. Of our indigenous trees *D. indicus* is always recognizable by its tall, leafless trunk, but the other species do not show, this peculiarity so much. All are however inclined to be gregarious, not to the same extent as the *Sàl* of Central India which sometimes forms pure forests to the exclusion of all other trees, but where one tree is seen many others of the same species congregate round it.

Calyx imbricate. Sepals surrounding the fruit. . 3. *Balanocarpus.*
Calyx valvate. Fruit sepals spreading . 4. *Vatica*
Calyx scarcely enlarged, segments, reflexed.
Stamens numerous . 5. *Valeria*

DIPTEROCARPUS. Gærtn. f.

Large trees with strongly penniveined leaves. Stipules large. Flowers large in axillary racemes. Stamens 30, connective produced into a bristle. Fruit enclosed in the enlarged persistent calyx, of which 2 (rarely 3) of the lobes are prolonged into wings.

Calyx-tube in fruit smooth, without wings . 1. *D. indicus.*
Calyx-tube in fruit with 5 lateral wings . 2. *D. Bourdilloni.*

57 1. **D. indicus.** Bedd. Fl. Br. Ind. i. 295 (under *D. turbinatus*). Bedd. Fl. Syl. t. 94. Gamble Man. Tim. 70. Tam. *Ennei.* Mal. *Kalpayin: vellaini.*

Leaves ovate, 4-5 in. by 2-3 in. with 10-15 pairs of veins. Petiole 1-2 in. Flowers white, fragrant, 1¼ in. across, 3 to 5 together. Fruit globose, brown, ⅔ in. diam., enclosed in the calyx-tube, two segments of which are prolonged into purplish-brown, membranous wings, 3-4 in. long.

A lofty, evergreen tree with a clean, unbranched trunk, common at the foot of the hills, and at elevations up to 3000 ft. especially in South Travancore. Height 120 ft. Diam. 4 ft. Found elsewhere in North and South Canara and Tinnevelly.

Flowers December-January. Fruits in April-May.

Bark smooth, pale, ⅓ in. thick. Wood greyish, red, rough, uniform, hard, without a heart. Pores numerous, large and medium-sized, ringed, often resinous. Rays prominent, long, very fine. Annual rings not seen.

W. = 47 lbs. P. = 695.

The wood is used on Tea estates for reepers for the roofs of buildings and for this purpose it answers well, but it is not durable, and is too coarse for furniture or other uses. It will not stand exposure. A sweet-smelling resin exudes from the stem which is used for rheumatism and for mixing with dammer.

Some Botanists consider this tree identical with the Gurjun-oil tree of Burmah, *D. turbinatus* which yields a valuable medicinal oil, largely used for leprosy. Whether these species are identical or not, they seem to be very much alike, and the oil of the tree deserves attention.

58 2. **D. Bourdilloni.** Brandis. Hook Ic. Pl. t. 2403. Gamble Man. Tim. 70. Tam. *Kar anjili.* Mal. *Charatta anjili.*

Leaves 8-18 in. by 5-10 in. ovate, acuminate, with 15-20 pairs of strong veins. Petiole 1½-2 in. Stipules, petioles and young parts covered with a dense, brown tomentum. Flowers white, 1½ in. across and 2 in. long. 3-5 in each raceme. Fruit globose, about 1 in. diameter, enclosed in the 5-angled calyx-tube, and surmounted by 2 wings 4-5 in. long by ¾ in. broad, all purplish-brown.

A magnificent evergreen tree of the sub-alpine forests through Central and North Travancore, local but not common. Height 150 ft. Diameter 4 ft. Occurs also in Malabar.

Flowers in January—February. Fruits May—June.

Bark pale, wood reddish-brown, smooth, moderately hard, no regular heart, though the older wood is darker. Pores large to very large, very numerous, evenly distributed. Rays prominent, moderately broad, with finer rays running between them. Annual rings indistinct.

W. = 42 lbs. P. = 572.

The wood is little known. Dug-out canoes are sometimes made out of the trunks of this tree. It yields a resin of which nothing is known.

2. HOPEA. Roxb.

Trees with glabrous leaves. Stipules small. Flowers small, in unilateral, axillary and terminal, racemose panicles. Calyx-segments imbricate, not combined into a tube. Stamens 15; connective produced into a bristle. Fruit enclosed in the calyx, 2 of the segments being enlarged into wings.

Panicles grey-tomentose, mostly terminal . 1. *H. parviflora.*
Panicles glabrous, mostly axillary.
  Leaves exceeding 5 inches apex rounded . 2. *H. Wightiana.*
  Leaves under 5 inches apex acute.
    Leaf nerves 7-9 pairs : branchlets pale-brown . 3. *H. glabra.*
    Leaf nerves 4 pairs : branchlets black . 4. *H. racophlœa.*

1. **H. parviflora.** Bedd. Fl. Br. Ind. i. 308. Bedd. Fl. Syl. t. 7. Gamble Man. Tim. 75. Tam. *Kongu*; *pongu*. Mal. *Thambagam*; *kambagam*. 59

Leaves ovate or lanceolate, glabrous, with 8-12 pair lateral nerves their axils often glandular, 2-4 in. by 1-2 in. Petiole $\frac{1}{2}$ in. Flowers creamy-yellow, sweet-scented, $\frac{1}{6}$ in. across on short pedicels, very numerous. Nut black, ovoid, apiculate, $\frac{1}{4}$ in. long, between 2 straw-coloured, membranous wings, each $1\frac{1}{2}$ in. by $\frac{1}{3}$ in.

A magnificent, evergreen tree of the moist forest of Travancore from 0-3000 ft. At one time it must have been a very common tree, but it has been so much felled during the last 20-30 years that it is scarce in all accessible localities. In the interior forests, not yet worked, the thambagam is abundant and gregarious, especially from 1000-2000 ft. At lower elevations this tree is less gregarious, and is found chiefly along river-banks.

The tree flowers profusely in January—February each year, and ripens its seed in May—June. The seeds germinate readily in the moist soil of the ever-green forests, or along river-banks, where thousands of small plants may be seen growing in the dense shade, but in such localities young saplings are rarely met with, showing that after a couple of years the young plants require more air and light. On the other

hand, thambagam springs up readily on old abandoned coffee-estates, under the shade of bushes and small trees, and in a few years they form almost pure forests, to the exclusion of the other trees.

The artificial propagation of this tree has not been attended with success. Seeds sown in nursery-beds do not readily germinate, and the plants which are produced are sickly. Further, plants collected from the forest and planted out fail in large numbers, probably owing to their long taproots having been broken in moving them. Foulkes says that "broad cast sowing is generally successful, especially along river banks." This all points to the necessity of carefully preserving natural forests of this valuable tree, in preference to the formation of regular plantations.

Thambagam is to be seen growing on every kind of soil, and though it no doubt thrives better in good soil, it is not averse to laterite and gravel. It begins life as a straggling bush with thin foliage: in a dozen years it has grown into a handsome cone-shaped tree with a straight stem and a smooth bark mottled with brown and white; later, the bark cracks and loses its white markings, till in old age the tree is recognized by its rusty-brown, cracked bark, its buttresses at the base and large excrescences some distance up the trunk, and its untidy head. It grows to a height of 120 ft. with a diameter of 4 ft.

As regards the rate of growth, nothing can be learnt from an examination of the wood, in which annual rings cannot be seen. The following measurements taken from a tree planted in the compound of the Forest bungalow at Malayattur in 1888 may be interesting. The measurements were taken at 4 ft. 6 in. above the ground.

At	10 years.	—	26 ft. high.	—	18 in girth.
	11 ,,	—	———	—	$20\frac{1}{4}$,,
	12 ,,	—	47 ft high.	—	$23\frac{1}{2}$,,
	14 ,,	—	———	—	$27\frac{1}{2}$,,

Taking the 12 year measurements, and allowing $1\frac{1}{2}$ in. for the bark, we get a diameter of about 7 in. at 12 years old or 3·4 rings per inch of radius and an average of 4 ft. in height each year. This is rapid growth, but the conditions may have been unusually favourable. From personal observation I should say that the tree grows lowly for the first 6 years of its existence, and after that more rapidly.

Bark rusty-brown. Wood light-brown when fresh cut, darkening with exposure, close-and even-grained, uniform, very hard. No regular heart. Pores medium-sized to small, fairly numerous, evenly distributed, and ringed. Rays moderately broad, prominent, equidistant and uniform. The weight varies from 57-68 lbs. per cub. ft. and the value of P. from 651 to 898, and the average of each may be taken as

$$W. = 63. \quad P. = 800.$$

The wood is extensively used for house-and bridge-building, and for beams and rafters it is superior to teak, and more durable. No white ants will touch it. The Railway Companies gladly accept it for sleepers when they can get it, but the wood is almost too valuable.

A large number of dug-outs used to be fashioned out of this tree annually, as they last longer than any other kind, but the employment of this wood for such a purpose has been stopped on account of the waste involved. These boats are said to last, with care, 30 or 40 years. At present about 3,000 candies, or, say, 50,000 cubic feet of thambagam are sold annually from our depots, the present price being 13-15 Rs. a candy, or say 14 annas per cubic foot, in log, and Re. 1, 6, 0 per foot sawn. This is equivalent to an increase of 40 per cent. during the last fifteen years. The price has since risen to Re. 1 as. 4 per c. ft. in log, and Re. 1 as. 12 per c. ft. of sawn timber.

2. H. **Wightiana**. Wall. Fl. Br. Ind. i. 309. Bedd. Fl. Syl. t. 96. Gamble Man. Tim. 74. 60

Leaves oblong, coriaceous, dark-green and smooth, with 6-10 pairs of nerves, base and apex rounded, 5-8 in. by 2-3 in. Petiole $\frac{1}{3}$ in. Flowers in long, racemose panicles 4-9 in. long and 2-4 together, each flower $\frac{1}{3}$ in. across, yellowish pink. Fruit ovoid, $\frac{1}{2}$ in. long, attached to dark-red wings, each 2-3 in. long and $\frac{1}{3}$ in. broad. Round echinate galls, $\frac{3}{4}$ in. diameter, are often found in the axils of the leaves.

A large tree, at one time, no doubt, very common in the plain-forests of Travancore but now almost exterminated, as it does not ascend the hills. It may be seen in-groves and along road-sides in the low country. Height 70 ft. Diameter 2 ft. Occurs also in Malabar from N. Canara southwards, and in Tinnevelly.

Flowers March—April. Fruits May June.

Gamble says that the wood is "brown, hard and close-grained, "smooth. Pores moderate-sized, surrounded by white ring, resinous, "often grouped 2 or 3 together. Medullary rays white, distinct. "uniform, fine, moderately numerous. Concentric white lines, re- "sembling annual rings." and gives

W. = 54 lbs.

The timber is said to be one of the best in Tinnevelly, and yields an excellent fuel.

3. H. **glabra**. W. and A. Fl. Br. Ind. i. 309. Bedd. Syl. t. 96. Gamble Man. Tim. 75. Tam. *Kara kongu*. Mal. *Illa pongu*. 61

Leaves lanceolate, 3-4$\frac{1}{2}$ in. by 1-1$\frac{1}{2}$ in. glabrous and dark-green above, paler beneath, lateral nerves 6-8 pair. Petiole $\frac{1}{3}$ in. Flowers in axillary, racemose panicles, 1-3 together, 2-6 in. long, each flower $\frac{1}{4}$ in. across, creamy-yellow. Fruit ovoid, surrounded by the segments of the calyx, of which 2 are enlarged into wings, dark-red and 2-2$\frac{1}{2}$ in. long.

An evergreen tree of medium size, common on river banks at 200 ft. elevation; at Kulathurpuzha and elsewhere. Not common. Height 60 ft. Diameter 1$\frac{1}{2}$ ft. Occurs in Tinnevelly.

Flowers January—February. Fruits June—July.

Bark blackish-brown, $\frac{1}{4}$ in. thick. Wood pale-brown, rather coarse and liable to split, very hard. No heart. Pores ringed, small, numerous. Rays fine and closely packed, uniform and equidistant. Annual rings indistinct.

W. = 68. P. = 857.

The wood is strong and serviceable, but does not appear to be used.

62 4. **H. racophloea**. Dyer Fl. Br. Ind. i. 310. Bedd. Fl. Syl. XXVII (under *H. sp.*) and Bedd. Ic. Pl. t. 185 (under *H. malabarica*). Gamble Man. Tim. 74. Tam. *Karun kongu.* Mal. *Neduvâli pongu Nai kambagam.*

Leaves broadly lanceolate, tapering to both ends, 2-4 in. by 1-2 in. with 4-5 pairs nerves and large axillary glands. Petiole $\frac{1}{3}$ in. Branchlets black. Flowers in axillary, racemose panicles, 3-4 in. long, 2-4 together pinkish-yellow. Fruit ovoid, attached to 2 reddish wings each 3 in. by $\frac{3}{4}$ in.

A tree of moderate size, confined to, the evergreen forests of the Hills from 500-2500 ft., rare. It is easily recognized by its black bark, which peels off with the lower end of each strip detached from the stem, and the upper still attached to it. Height 60 ft. Diameter $1\frac{1}{2}$ ft. Occurs also in Malabar.

Flowers April—May. Fruits June—July.

The weight and strength of this timber have not been determined. The wood is pale-brown, turning dark with exposure, of a finer grain than *H. parviflora* but it is not obtainable of large size. It is very useful for building purposes, but is too heavy for furniture.

3. BALANOCARPUS. Bedd.

Trees with penniveined leaves. Stipules minute. Flowers small in unilateral, axillary, racemose panicles. Stamens 15, terminating in a bristle. Fruit-sepals imbricate, equally enlarged, forming a shallow cup round the fruit. Fruit hard, indehiscent, beaked.

Young parts hoary-pubescent : fruit sepals acute : fruit less than $\frac{3}{4}$ in. .. .. .. 1. *B. utilis.*
Young parts glabrous: fruit-sepals truncate : fruit exceeding $\frac{3}{4}$ in. .. .. .. 2. *B. erosa.*

63 1. **B. utilis.** Bedd. Fl. Br. Ind. i. 309 (under *Hopea longifolia*). Bedd. Fl. Syl. t. 330 and CCXXXVII. Gamble Man. Tim. 83.

Leaves lanceolate, narrowed to the base, with 10-12 pairs of nerves, 5-6 in. by $1\frac{1}{2}$ in. Petiole $\frac{1}{2}$ in. Panicles and young parts hoary-pubescent. Flowers $\frac{1}{8}$ in. long, numerous. Nut globose, pointed, $\frac{1}{2}$ in. diameter, the calyx segments very tuberculate.

A lofty tree, found in the Tinnevelly Hills south of Courtallum between 1000-3000 ft. elevation, and most probably occurring in Travancore, but not yet observed here.

It is said to yield a valuable timber.

64 2. **B. erosa.** Bedd. Bedd. Fl. Syl. CCXXXVII & t. 329. Gamble Man. Tim. 84.

Leaves oblong-lanceolate rounded to the base, with 12-14 pairs of nerves, 4-7 in. by 1-2 in. Petiole $\frac{1}{4}$ in. Panicles and young parts glabrous. Flowers $\frac{1}{4}$ in. long, numerous. Nut oblong, pointed, over 1 in. long and $\frac{3}{4}$ in. diameter, calyx-segments smooth.

A large tree, found on the Tinnevelly Hills between 2000-3000 ft. elevation, and probably to be found in the drier forests of Travancore. I have not seen it.

The timber is said to be good.

4. VATICA, Linn.

Large trees with penniveined leaves. Stipules small. Flowers large, in compact, axillary panicles. Calyx valvate, enlarged in fruit, segments erect, equal in fruit and spreading, not winged. Stamens 15, apiculate. Fruit 3-grooved, indehiscent.

V. Roxburghiana. Bl. Fl. Br. Ind. i. 302. Bedd. Fl. Syl. t. 95. Trimen Fl. Cey. i. 128 (all under *V. Roxburghiana*). Gamble Man. Tim. 84. Mal. *Adakka payin*. 65

Leaves oblong-lanceolate with a rounded base, 4-10 in. by $1\frac{1}{2}$-3 in. with 10-14 pairs of nerves. Petiole 1-2 in. Flowers in panicles, 3 in. long fragrant, white, each 1 in. across. Fruit globose, beaked, almost 1 in. diam. surrounded at the base by the enlarged sepals.

A handsome, evergreen tree, occurring on the banks of rivers at low elevations through Travancore. Not uncommon. Height 80 ft. Diam. 2 ft. Occurs also in Ceylon and Malabar.

Flowers February—March. Fruits in June.

Bark smooth grey, very thin, 1/10 in. thick. Wood reddish-brown, hard, close-grained and smooth, much like thambagam. Pores small, numerous, often filled with resin. Rays fine, numerous and close together. Annual rings indistinct, Gamble gives 5 rings per inch. Fibre long. My experiments gave

W. = 63 lbs. P. = 1013.

but Gamble's figures are not quite so high.

A first rate wood, though little known in this country, and not used because thambagam has been easily obtainable. The tree is well worth attention. Trimen says that the wood is much used in Ceylon, and that a yellow, transparent resin exudes from the stem.

5. VATERIA, Linn.

Trees with coriaceous, penniveined leaves. Stipules narrow, deciduous. Flowers large, in lax, terminal and axillary panicles, Calyx-segments imbricate. Stamens about 50. Anthers linear, apiculate. Fruit large, indehiscent, fruit-sepals reflexed, not enlarged.

V. Indica. Linn. Fl. Br. Ind. i. 313. Bedd. Fl. Syl. t. 84 (under *V. malabarica*). Gamble Man. Tim. 85. Eng. *The Piney varnish* or *Indian Copal tree*. Tam. *Vellei kunthrikkam*. Mal. *Payin: paini:* 66

Leaves ovate, rounded at the base, 4-8 by 2-4 in. with 14 pairs of strongly marked nerves. Petiole 1-$1\frac{1}{2}$ in. Flowers $\frac{3}{4}$ in. across, white, drooping and very fragrant, on $\frac{1}{2}$ in. stalks. Fruit ovoid, rough, pale-brown, about 2 in. long by $1\frac{1}{2}$ in. diam.

A very large, evergreen tree with a smooth, cylindrical stem blotched with green and white, abundant in the forest of the lower

hills and ascending to 2,500 ft. through Travancore. Extensively planted in avenues on account of the fragrance of the flowers. This tree is of fast growth, attaining a height of 30 ft. and a diameter of one foot in 12 or 15 years. Its roots spread for a long distance, and other trees do not readily grow beneath it. For this reason it is unsuited as a shade tree for coffee. The best way to propagate it is to sow the large seeds, after germination has begun. This is preferable to putting out plants. as in doing so the tap-root would be broken. Height 100 ft. Diam. 3 ft. Occurs also in Malabar, but not out of South India.

Flowers March to April. Fruits June to July.

Bark green and white, ½ in thick. Sapwood greyish-white. Heart-wood pale greyish-brown rough, moderately hard, straight, but loose-grained, with a short fibre. Pores rather large, often divided, often filled with resin. Rays prominent, broad and distant, with very fine rays between them. The wood shows many concentric rings all oe which cannot be annual.

W = 39 lbs. P. = 415.

The timber of this tree is very little used, as it is not strong, while the grain is coarse and rough. It is not suited for tea-boxes, being too heavy, but it appears not to be bored by bettles, and it might therefore be serviceable for shelves, rough doors and so forth. The chief value of the tree is for its gum-resin which "makes an excellent" "varnish like copal. Specimens of the resin differ much in colour" "from amber to pale green. It burns with a clear light, giving off" "a pleasant smell. Under the influence of gentle heat it combines" "with wax and oil, and forms an excellent resinous ointment Its" "seeds yield a vegetable butter known as the Piney tallow of" "Canara." (Pharm. Ind. i. 197.) As far as I know there is no trade in the resin in Travancore.

ORDER XIII. MALVACEÆ.

Trees with alternate, simple or digitate leaves, with or without stipules. Flowers regular, bisexual. Sepals 5, valvate. Petals 5 or 0, imbricate. Stamens many, filaments monadelphous forming a tube, or in 5 bundles. Anthers I- celled. Ovary 2-or many-celled with 1 or more ovules in each cell. Fruit capsular.

A large Order of shrubby plants and weeds, but containing only 7 trees wild in travancore. To this belong the following cultivated plants *Hibiscus Rosa-Sinensis* the "Shoe flower" from China, *H. Sabdariffa* the "Roselle," and *H. esculentus* the "Brinjal" both from the West Indies, *Gossypium herbaceum* the "Cotton" plant of India, and, among trees, *Adansonia digitata* the "Baobab" from West Africa, remarkable for the great thickness of its, trunk and *Durio zibethinus* the "Durian" ef Malaya, which produces a delicious but strong smelling, thorny fruit.

NOTE.—In N. Travancore I have often been told of a large tree, called 'Shurali" in Malayalam, which is said to be abundant on the Periyar river near Neriamangalam, and to be different from the "Payin." Flowers sent to me were those of *Vateria indica*. It is possible that there may be two species of this genus indigenous in Travancore. Shurali is Hardwickia pinnata, q. v.

Stamens monadelphous, froming an undivided tube
- Styles spreading. Stigmas 5 ... ... 1. *Hibiscus*
- Styles connate. Stigma clubbed — — 2. *Thespesia.*

Stamens connate at the base, 5-adelphous above.
- Leaves compound. Bracteoles 0— —
  - Stamens numerous. Stem thorny — 3. *Bombax.*
  - Stamens apparently 5. Stem smooth— — 4. *Eriodendron.*
- Leaves simple. Bracteoles 3-6
  - Leaves penniveined. Petals 0 — — 5. *Cullenia.*
  - Leaves with 5-7 basal nerves. Petals 5 — 6. *Kydia.*

1. HIBISCUS. Medik.

Trees and shrubs with stipulate, usually lobed, leaves. Flowers very large, solitary or few. Petals 5. Staminal tube bearing numerous anthers. Ovary 5-celled with several ovules in each cell. Capsule 5-valved.

H. tiliaceus Linn. Fl. Br. Ind. i. 343. Bedd. Fl. Syl. xxix. Trimen Fl. Cey. i. 157. Gamble Man. Ind. Timb. 87 Tam and Mal. *Nirparatthi.*

Leaves rotund-cordate, acuminate, about 3 in. each way, dark-green above, white beneath. Petiole $1\frac{1}{2}$ in, Stipules $\frac{1}{2}$ in. ovate. Flowers pale-yellow with a crimson centre, 3 in. across, on $\frac{1}{2}$ in. pedicels. Bracteoles 10. Capsule $\frac{1}{2}$ in. pointed, ovoid.

An ornamental tree common on the banks of backwaters and tidal rivers throughout Travancore. Height 30 ft. Diam. 8 in Common throughout the tropics of both hemispheres.

Flowers December-March : Fruits May-June.

Gamble gives the weight of the wood at 35 lbs per cub. ft. The wood is soft and grey with a purplish heart. It is not used except as fuel. The bark yields a fibre suitable for rough ties. "It has the advantage of not easily getting rotten under water." (Gamble).

2. THESPESIA. Corr.

Trees or shrubs with entire, or lobed leaves, and small stipules. Flowers axillary, large, solitary or few. Sepals combined into a truncate calyx. Petals 5. Ovary 4-5-celled with many ovules in each cell. Fruit a 5-valved capsule.

T. populnea. Corr. Fl. Br. Ind. i. 345. Bedd. Syl. t. 63. 68
Trimen Fl. Cey. i. 158. Gamble Man. Tim 88. Eng. *The portia tree.* Tam. *Púvarassam*: *chilánthi.* Mal. *Porassu.*

Leaves cordate, entire, palmately 7-veined, 3-5 in each way. Petioles 1-3 in. Flowers solitary, 2-3 in. across, yellow turning purplish-pink as they wither. Bracteoles 0. Capsule 1 in. globose, not pointed.

An evergreen tree, doubtfully wild in Travancore, but extensively grown from cuttings to form avenues and hedges on the coast. It grows rapidly, but is very untidy, dropping large quantities of leaves. Height 40 ft. Diam. 1 ft. Wild in Ceylon, Burma and parts of India, and has been introduced on all the shores of the tropics.

Flowers all the year round, but the seed seldom ripens in our moist climate.

Bark dark-brown. Sapwood white, soft, heartwood dark-red, hard. Pores evenly distributed, of moderate size, few. Rays fine and uniform. Gamble gives

W. — 50 lbs. P. — 712.

Though so common a tree, I have not experimented with it.

The wood is highly valued in Travancore because it does not split. It is employed for gun-stocks, furniture and cartwheels "The bark' 'gives a good fibre, and a yellow dye very like gamboge, is obtained from the capsules." (Gamble).

3. BOMBAX. Linn.

Trees with digitate leaves and thorny stems, stipules small, Flowers axillary, without bracteoles. Calyx cupshaped, truncate or irregularly lobed. Petals 5 twisted in bud Stamens numerous, connate at the base. Ovary 5-celled with many ovules in each cell. Capsule 5-valved with many black seeds imbedded in cottony wool.

Leaflets stalked.	Stamens about 80.	Style 5-fid	1. *B. malabaricum.*
Leaflets sessile.	Stamens about 600,	Style simple	2. *B. insigne.*

69 1. **B. malabaricum.** DC. Fl. Br. Ind. i. 349. Bedd. Fl. Syl. t 82. Brandis For Fl 31. Trimen Fl. Cey. i 160, Gamble Man. Tim. 90 Eng. *The Cotton tree.* Tam. and Mal. *Ilavu.*

Leaves deeply digitate into 5-7 lanceolate leaflets, each 4-8 in. by $\frac{3}{4}$-1 in on short stalks. Petiole 6-10 in. Flowers 3 in. across and long, usually dark-crimson, but sometimes white, on short, thick pedicels, solitary, appearing before the leaves. I am inclined to think that this tree has never white flowers and that all such flowers belong to the next species. Stamens about 80, with red filaments and brown anthers. Style 5-fid. Capsule about 4 in. long, green, cylindrical, smooth, tapering to both ends. Seeds $\frac{1}{4}$ in. diam. smooth, ovoid, in white cotton.

Our largest forest tree, bare of leaves for several weeks in the hot weather. It is found both in the deciduous and evergreen forests through Travancore, between sea level and 4,000 ft. towering high above all the other forest trees. The trunk is straight and clear of branches for a great height, cylindrical above, but at its base, it is supported by huge spreading buttresses, to a height of 10 or 12 ft. The bark is white, and in young trees is covered with numerous hard prickles, which fall off as the tree grows older. The huge branches spread out horizontally and the nests of wild bees are often suspended from them. Height 130 ft. Diam. 8 ft. It is common through India, Burma and Java.

Flowers in December—January. Fruits in April—May.

Bark grey covered with conical prickles when young, deeply cracked when old, Wood greyish-white turning to brown in old trees strongly marked on a longitudinal section by the pores. It has no heartwood nor annual rings. Pores scanty, very large, often

divided and evenly distributed. Rays indistinct but numerous, fine to broad. Growth fast, 4-5 rings per in. Easily reproduced by cuttings.

W. = 29 lbs. P. = 519.

The wood is soft, and perishable, and is much bored by beetles and eaten by white ants. It is used for sea-going boats as it lasts longer in salt water, for rough planking and especially for tea-boxes.

The gum is used medicinally, and a whitish fungoid mass, known as Mocha-ras, exudes from wounds in the bark. It is used in native medicine. The cotton is used for stuffing pillows.

2. **B. insigne.*** Wall (?) Fl. Br. Ind i, 349 Gamble Man. 70
Tim. 91. Tam. and Mal. *Kal ilavu : par ei ilavu.*

Leaves digitate of 6-8 sessile, distinct leaflets, 5 9 in by 1-2 in. lanceolate acuminate at both ends, dark-green and glabrous above. Petiole 6-12 in. Flowers pinkish-white, 4 in, across and 7 in, long, solitary, appearing before the leaves. Stamens about 600, with slender white filaments. Style simple. Capsule 7 to 10 in. long, velvetty-brown. Seeds black, smooth, $\frac{1}{4}$ in. diam. packed in white cotton.

A small tree having the appearance of the ordinary Cotton tree, but never attaining its size. Height 40 ft. Diam. 1 ft. It is always found growing on rocks, hence its native name. I have only recently observed it, in the Konni valley, at an elevation of about 500 ft., but it is reported to be more common in the interior, and to be found in many parts of the country. It occurs also in Malabar, Burmah, Pegu and the Andaman Islands.

Flowers in December-January. Fruits January-February.

The stem is covered with prickles in clusters of 1-12, about $\frac{3}{4}$ in. long Bark grey, $\frac{2}{3}$ in. thick. Wood white and very soft No heart and no annual rings Pores few, very large, often divided. Rays very numerous, broad and prominent.

W. = 21 lbs. P. = 180.

4. ERIODENDRON. DC.

Trees with digitate leaves and small stipules. Flowers clustered. Calyx cup-shaped. Petals 5. Stamens apparently 5, connate at the base, each bearing 2 or 3 sinuous anthers. Ovary 5-celled with numerous ovules in each cell. Capsule 5-valved. Seeds surrounded by silky cotton.

E. anfractuosum. DC. Fl. Br. Ind. i. 350 Bedd Fl. Syl. 71
xxx. Trimen Fl. Cey. i. 161. Gamble Man. Tim. 91. Eng. *The Silkcotton tree.* Mal. *Panya.* Tam. *Panji.*

Leaves with 5-7 lanceolate leaflets, entire, or serrulate near the tip, 3-5 in. long, on short winged stalks. Petioles 4-6 in. long. Flowers white, $1\frac{1}{2}$-2 in. across on 1 in pedicels. Capsule cylindrical,

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*Note: The description given in the Flora Br. Ind. does not by any means fit this tree. There are many points of difference. I have accordingly put a query after the name.

pointed at both ends, 4-5 in long by 1½ in. diam. green. Seeds black, globose ¼ in.

A tall tree of rapid growth with a smooth, green stem and horizontal branches not indigenous in Travancore but naturalized here, and often planted about villages. Height 50 ft. Diam. 1 ft. Supposed to be a native of Malaya, but cultivated in the tropics of both hemispheres.

Flowers and fruits twice a year in February and September, but chiefly in the former month.

Gamble says that the wood is yellowish-white. Pores large scanty and often sub-divided. Rays fine, and gives

W. = 30 lbs. P. = 400.

The wood is soft and useless. The tree is grown for the sake of the silk-cotton which is used for stuffing pillows. A red gum exudes from the stem.

5. CULLENIA.* Wight.

A lofty tree with entire, simple, penniveined leaves without stipules. Flowers in fascicles from the old wood. Bracteoles 3-5, forming a cylindrical tube. Calyx tubular. Petals 0. Stamens many, combined into a tube below, 5-adelphous above. Anthers small, clustered. Ovary 5-celled with 2 ovules in each cell. Fruit a spiny capsule, containing large seeds enveloped in an aril.

72 **C. excelsa.** Wight. Fl. Br. Ind. i. 350. Bedd. Fl. Syl. xxx. Trimen, Fl. Cey. i. 162, Gamble Man. Tim. 92. Tam. *Vedaplá: polavu*; *ainiplá*: al. *Kar aini*. Kar-anjili.

Leaves broadly lanceolate, 3-6 in. by 1-2 in., shining and dark green above, covered with orange coloured scales beneath. Petiole 1 in. Flowers brownish white, 1½ in. long by ⅓ in. broad. Fruit globose, about 5 in. diam., covered with long green spines, and containing 8-10 shining brown seeds, each 1 or 1½ in. long and ½ in. thick. A very large evergreen tree of the moist forests between 2000–5000 ft., common through Travancore. Like the Cotton tree this tree has buttresses at its base. The stem is clear of branches to a great height and is often fluted. The bark is smooth, white and thick. Height 100 ft. Diam. 4 ft. Found also in Malabar and Ceylon.

Flowers January-March. Fruits November-December.

The wood is pale-brown, turning dark with exposure, straight-grained, but rough and soft. No. heart. Pores scanty, rather large. Rays numerous and very fine. Annual rings indistinct.

W. = 34 lbs. P. = 508.

In our moist climate the wood decays very rapidly, and should on no account be used. In the drier air of Tinnevelly it lasts much better, and young saplings are cut for bandy-poles. Gamble also mentions that it is well spoken of there.

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*Named after Major-General Cullen, British Resident in Travancore from 1840-1860, who first discovered the tree.

6. KYDIA, Roxb.

Trees with palminerved, usually lobed leaves, and polygamous flowers in terminal panicles. Bracteoles 4-6, connate below, spreading in fruit. Sepals and petals 5. Staminal tube divided into 5 segments at about half their length, each bearing 3-8 anthers. Ovary 2-3-celled with 2 ovules in each cell. Capsule 3-valved, globose.

K. calycina. Roxb. Fl. Br. Ind i. 348. Bedd. Fl. Syl. xxviii. 73
Brandis For. Fl. 20 Gamble Man Tim 89.

Leaves 3-6 in. each way, with 5-7 basal nerves, ovate, serrate and angled at the apex. Petiole 1-3 in. Bracteoles oblong, pale brown. Flowers white or pink, ½ in. across. Capsule ¼ in. diam. tomentose, containing 2-3 reniform, brown seeds.

A small tree only recently observed by me at the edges of sholas near Ponmudi sanitarium at 3000 ft. It occurs, no doubt elsewhere in the hill-forests of Travancore. Common through India and Burmah, but absent from Ceylon. Height 40 ft. Diam. 1 ft.

Flowers from July-October. Fruits in December-March. The tree puts on new foliage in April-May.

Gamble says that the bark is ¼ in. thick and grey. Wood white, soft; heart-wood grey. Pores scanty, moderate-sized. Rays numerous. Annual rings marked by white lines. Growth very fast and he gives

W. = 36 lbs.

The wood is of little use, being unsuitable even for fuel. The bark yields a fibre.

ORDER XIV, STERCULIACEÆ.

Trees with alternate, stipulate, simple or digitate leaves. Flowers regular, unisexual or bisexual. Sepals 5, rarely 4-6 or 7, valvate. Petals 5 or 0, slightly connate at the base. Stamens 5-15, often with staminodes, or monadelphous with numerous anthers. Anthers 2-celled. Ovary 2-5 celled, with few or many ovules in each cell. Fruit-carpels distinct or, united into a capsule. Seeds often winged.

A large Order including about 15 trees indigenous or naturalized in Travancore. The timber is soft and light in the species of *Sterculia* but in the other genera it is hard and strong. Some of the species yield a good fibre. To this Order belongs *Theobroma Cacao* the "Cocoa" tree, native of Central and South America and *Cola acuminata* the "Cola nut" of Africa. *Kleinhovia hospita*, a handsome tree from East Africa, is sometimes found in gardens.

Flowers unisexual or polygamous: petals 0.
Anthers 10-20: fruit follicular . . . 1. *Sterculia.*
Anthers 5: fruit indehiscent . . . 2. *Heritiera.*

Flowers bisexual : petals 5.
Seeds winged
Anthers numerous : staminodes 0 . 3. *Eriolæna.*
Anthers 15 : staminodes 5 . 4. *Pterospermum.*
Seeds not winged .
Petals appendaged : capsule tubercled . 5. *Guazuma.*
Petals simple : capsule smooth . 6. *Leptonychia.*

1. STERCULIA. Linn.

Leaves simple or digitate, Flowers unisexual or plygamous. Sepals 5. Petals 0 Stamens combined into a central column, Anthers 10-20. Carpels 2-- distinct borne on a long gynophore Seeds 2-many in each carpel, often with an aril.

Seeds not winged.
Follicles woody.
Leaves digitate . 1. *S. fœtida.*
Leaves palmately lobed
Panicles erect : follicles armed with bristles . 2. *S. urens.*
Panicles pendulous : follicles downy . 3. *S. villosa.*
Leaves simple, not lobed, 1-nerved.
Calyx lobes broad, spreading 4. *S. guttata.*
Calyx lobes narrow connate at the tips . 5. *S. nobilis.*
Follicles membranous . 6. *S. colorata.*
Seeds winged . 7 S *alata.*

74 1. **S foetida** Linn. Fl. Br Ind i 354. Bedd Fl Syl xxxi. Trimen Fl. Cey. i. 164. Gamble Man. Tim. 93. Tam. *Pinári*

Leaves digitate, on long petioles. leaflets 5-9, each 5-7 in long, lanceolate, tapering at both ends Flowers about 1½ in across, in erect panicles. dull orange-red, coming out with the new leaves. Fruit of 1-5 ovoid, scarlet follicles about 5 in long, containing 10-15 ovoid, black seeds with a yellow aril.

A moderate-sized, deciduous tree of the open forests of South Travancore, at low elevations, rare The flowers have a very disgusting odour Height 30 ft Diam 1 ft Occurs also in Malabar. Ceylon, Burmah, N. Australia and Africa

Flowers in February—April Fruits in August-November.

Gamble, quoting Skinner, gives W. = 28 lbs. P. = 464.

Beddome says that the wood is light, tough, open-grained and yellowish white, and that it is used for house-building canoes and packing-cases The seeds are eaten.

75 2 **S urens** Roxb Fl. Br. Ind. i. 355 Bedd Fl Syl xxxii. Brandis For Fl 33 Trimen Fl Cey. i. 164. Gamble Man. Tim. 94. Tam *Kivalam.* Mal. *Thondi.*

Leaves 5-7-lobed, lobes entire, 8 12 in long and broad Flowers greenish-yellow, ⅓ in across Fruit of 4-6 sessile, radiating follicles, 1-3 in long, reddish yellow and covered with stinging bristles. Seeds brown, 3-6 in each follicle.

A deciduous tree of medium-size occurring at low elevations in the open forests. Height 30 ft Diam 1 ft. Occurs also in Northern and Eastern India and Ceylon.

Flowers in December-January. Fruits in April-May.

Gamble says that the wood is very soft, reddish-brown with a lighter coloured sapwood. Pores large and rays of moderate breadth and gives

W. = 42 lbs.

The wood is too soft for anything but native toys. The seeds are eaten. Gum is freely produced by the tree, which is collected by some forest-tribes. (Pharm. Ind. i 230.)

3. **S. villosa**. Roxb. Fl. Br. Ind. i. 355. Bedd. Fl. Syl. xxxii. Brandis For. Fl 32. Gamble Man. Tim. 94. Eng. *The Elephant rope tree.* Tam. *Muratthan*. Mal. *Vakka.* 76

Leaves deeply 5-7-lobed, lobes toothed, crowded at the ends of branches, 12-18 in. each way, glabrous above, downy beneath. Flowers cream-coloured, ½ in. across, coming out before the leaves. Fruit of 2-7 brown carpels. 1½-3 in. long, downy, each containing several seeds.

A moderate-sized. deciduous tree of the open forests at low elevation, very common throughout Travancore. Height 30 ft Diam. 1 ft. Occures throughout India and Burmah, but notin Ceylon.

The bark is grey and smooth and is very much used for elephant-ropes for dragging timber, as it is much stronger than any other.

Gamble says that the growth is fast, 3-6 rings per inch, and gives

W. = 18 lbs.

The wood is not used for anything.

4. **S. guttata**. Roxb. Fl. Br. Ind. i. 355. Bedd. Fl. Syl. t. 10. Trimen Fl. Cey. i. 165. Gamble Man. Tim. 95. Tam. *Kávalam*. Mal. *Kithondi.*. 77

Leaves simple. entire oval, rounded at the base, acuminate, 5-10 in by 3-4 in. Petioles 2-3 in. Flowers white, dotted with pink, ½ in. across. Fruit of 1-5 follicles each 3 in. long, scarlet. Seeds black.

A moderate-sized tree, very common in the evergreen forests at low elevations up to 2000 ft. through Travancore. Height 60 ft. Diam. 2 ft. Also found in Malabar, Ceylon, Malacca and the Andaman islands.

Flowers in September-February. Fruits in June.

Bark brownish-white, rather smooth, ½ in. thick. Wood extremely soft, greyish-white, rough and soon perishing. No heart. Pores few, very large. Rays broad and prominent. Annual rings indistinct.

W. = 22 lbs. P. = 197.

The wood is not used.

5. **S. nobilis.** R. Br. Fl. Br. Ind. i. 358. Fl. Syl. xxxii (under *S. Balanghas*) Gamble Man, Tim. 93. Tam. *Kávalam.* 78

Leaves simple, entire, oblong, acuminate, very glabrous, 4-7 in. by 2-4 in. Petiole ½-1 in Flowers rather fragrant, in drooping axillary panicles, purplish-red, ⅓ in. across Fruit of 3-5 beaked, ovoid follicles, containing 6-8 black seeds each.

A small tree found at Quilon, on the Rani river, and near Ariyankavu, in gardens and near roads, perhaps naturalized and not really wild. Height 30 ft. Diam. 8 in. Occurs also in China and Sumatra.

Flowers in September Fruits in June.

The seeds are eaten. The tree has no other uses.

S. Balanghas, Linn. a tree found by Lawson in South Travancore & mentioned in Brandis. Ind., Tr., 84, not seen by me. It resembles S. nobilis but has leaves up to 15 in. long & the young shoots, petioles & inflorescence are covered with tawny pubescence Flowers greenish-purple.

79 6 **S colorata** Roxb Fl Br Ind i. 359 Bedd Fl. Syl. xxxii Brandis For Fl 34 Trimen Fl. Cey. i 166. Gamble Man. Tim. 96 Mal *Malam paratthi.*

Leaves palmately 3-4 lobed, 4-6 in. long and broad. Petiole 4 in. Flowers scarlet, downy, about ½ in. long, in erect racemes, appearing when the tree is bare of leaves. Fruit of 1-5 membranous follicles, each 3 in. long greenish-pink, opening out flat and containing 2 ovoid, yellow seeds,

A large tree found sparingly both in the deciduous and evergreen forests Height 80 ft. Diam. 1½ ft. Occurs also through Central and Southern India, in Burmah and Ceylon.

Flowers in February—March Fruits in May-June.

Gamble says that the wood is grey and very soft, and that the growth is fast, 3-4 rings per in. of radius, and gives

W. = 24 lbs.

80 7. **S. alata.** Roxb. Fl. Br. Ind. i. 360. Bedd. Fl. Syl. xxxii and t. 230 (under *S. Haynii,*) Gamble Man. Tim. 96. Mal. *Ana thondi* : *potthondi.*

Leaves simple, entire, cordate-ovate, glabrous, 4-12 in. by 3-8 in., 3-7-nerved at base. Petiole 2-4 in. Flowers rusty-brown, tomentose, nearly, 1 in. long on short panicles on the old wood. Fruit of 3-5 large follicles, each 4-5 in long, pubescent, containing about 30 brown, winged seeds, 2 3 in. long.

A very large tree found in the evergreen forests at low elevations in North and Central Travancore, and sometimes ascending the hills to 3000 ft; fairly common. Height 120 ft. Diam. 4 ft. Occurs elsewhere in Tinnevelly. Malabar, Sylhet and Chittagong.

Flowers in January February. Fruits in November-December.

W. = 41. P. = 613.

The bark is pale and the wood light-yellow. It is not used.

HERITIERA. Aiton.

Trees with simple leaves, scaly beneath Flowers small, unisexual in axillary panicles. Calyx 4-6-toothed. Petals 0. Stamens combined into a column. Anthers 4-6. Carpels 4-6, ovule solitary. Ripe carpels indehiscent, keeled or winged.

Leaves oblong, exceeding 5 in. by 2 in. Carpel woody, keeled. 1. *H. littoralis*
Leaves lanceolate, less than 5 in by 2 in. Carpel samariod, membranous .. 2 *H. Papilio.*

1. **H. littoralis** Dryand Fl. Br Ind i. 363 Bedd. Fl. Syl. 81
xxxiii. Trimen Fl. Cey. i. 167. Gamble Man Tim 98.

Leaves oblong, base rounded, glabrous above, silvery beneath, 5-8 in by 2-4 in Petiole $\frac{3}{4}$-$1\frac{1}{2}$ in Flowers $\frac{1}{7}$ in long, greenish-pink. Fruit of 1-3 spreading, woody carpels about $2\frac{1}{2}$ in long, pale-brown, with a broad keel on one side, smooth, and shining Seed 1 in long

A tree of moderate size, probably occurring along our backwaters, though I have not observed it "Found on all tropical shores of" "the old world, the hard indehiscent carpels being carried by the" "waves" (Trimen.)

Flowers July-October. Fruits in January

Gamble says that the bark is longitudinally furrowed, and the wood dark, red and hard, and Beddome that the weight of unseasoned wood is from 75-80 lbs. and when seasoned 64 lbs For ordinarily seasoned wood we may take.

W = 68 lbs.

Beddome says that the "wood is strong, fibrous and flexible," "tolerably close and straight-grained, not very durable and not," easily worked," and that "it is used for poles and shafts of carri-" 'ages. and spokes of wheels, and makes excellent firewood." Trimen says that it is very durable

2. **H. Papilio.** Bedd. Fl. Br. Ind. i. 363. Bedd Fl Syl. t. 82
218 Gamble Man. Tim 99 (under *H acuminata*). Tam. *Chavandabi.*

Leaves lanceolate. acute at the apex, 3-nerved at the base. glabrous above, silvery beneath, 3-5 in. by $1\frac{1}{2}$-2 in, young parts clothed with soft, golden tomentum. Flowers cream-coloured, $\frac{1}{6}$ in. long. Fruit of 1-6 samaroid, winged, brown carpels each about $2\frac{1}{2}$ in. long.

A very large tree found in our evergreen forests at elevations between 2,000-4,000 ft at Peermede and Ponmudi, but not common. Abundant in the forests near Parapet Estate at the head of the Shendruni Valley. Height 80 ft. Diam 2 ft It is also found in the forests of Tinnevelly. It appears to be more common there than with us.

Flowers in August-September. Fruits in February-March.

Gamble says "Wood red, very hard, structure similar to that of "*H. littoralis* but pores less numerous and smaller, and transverse- bars more numerous and more prominent, irregular," and his specimens give an average of

W. = 57 lbs.

The timber seems to be used for building, cart-poles and agricultural implements in Tinnevelly, but it is not known here.

3. ERIOLÆNA. DC.

Trees with simple or lobed leaves. downy beneath. Peduncles axillary, 1-many flowered. Flowers bisexual, supported by 3-5 bracteoles. Calyx deeply 5-cleft. Petals 5, clawed. Staminal column short bearing many anthers. Staminodes 0. Ovary tomentose, 5-10-celled, syncarpous. Capsule woody. Seeds winged.

83 **E. quinquelocularis.** Wight. Fl. Br. Ind. i. 371. Bedd. Fl. Syl xxxv. Gamble Man. Tim. 102. Brandis Ind. Trees. 87. Tam. *Nai únam.* *Vatta-unnam* Mal. *Vedinar.*

Leaves ovate, cordate, serrate, palmately 7-nerved, dull-green and glabrous above, pale and pubescent beneath, 2-5 in. long and broad. Petiole 1-2 in. Flowers in panicles, $1\frac{1}{2}$ in. across. Capsule 5-celled, smooth, brown, ovoid about 1 in. long, containing 30 or more winged seeds.

A small tree common on the Cardamom Hills at an elevation of 3,000 ft. Found also on the Neilgherries and other mountains of the Western Peninsula. Height 20 ft. Diam. 6 in.

Flowers in July-August. Fruit ripens in January-February.

Bark $\frac{1}{2}$ in. thick, blackish-brown, vertically cracked, fibrous. Wood extremely hard, very elastic but cross-grained, reddish or purplish brown, rather rough. Pores medium-sized to large, often divided, numerous. Rays broad and long, conspicuous, crossed, by dark concentric lines.

W = 59 lbs. P = 916.

4. PTEROSPERMUM. Sherb.

Trees with oblique, stipulate leaves, silvery-white or yellow beneath, of two kinds, palmately lobed on the young plants, and entire, or coarsely toothed, on the older. Flowers few, large, bisexual. Bracteoles deeply divided. Sepals and petals 5, connate at the base. Staminal column short, bearing 15 anthers and 5 ligulate staminodes. Ovary 5-celled, with several ovules in each cell. Capsule woody, 5-valved Seeds winged.

Leaves lanceolate, less than 3 in. long ..	.. 1. *P. rubiginosum.*
Leaves cuneate 3-4 in. long ..	.. 2. *P. reticulatum.*
Leaves rectangular, exceeding 6 in. long ..	.. 3. *P. glabrescens.*

84 1. **P. rubiginosum.** Heyne. Fl. Br. Ind. i 368. Bedd. Fl. Syl. t 106 Gamble Man. Tim. 101. Tam. *Chittilei polavu.* Mal *Malam thodali.*

Leaves unequal-sided, entire, lanceolate, $1\frac{1}{2}$ $2\frac{1}{2}$ in. by $\frac{1}{2}-\frac{3}{4}$ in, dark-green above, buff or white beneath Petiole $\frac{1}{4}-\frac{1}{2}$ in. Stipules oblique, lacinate. Flowers white. $1\frac{1}{2}$ in. across, few together. Capsule brown, 2 in. long by $\frac{3}{8}$ in. diam.

A tall and very graceful tree found in evergreen forests throughout Travancore between 0-3000 ft, but nowhere abundant, Height 80 ft. Diam. 2 ft. Occurs also in Malabar.

Flowers from Sept.--Feb. Fruits May—July.

Bark brown, $\frac{1}{6}$ in. thick. Wood bright-pink, from light to dark shades, very handsome, close-grained and extremely hard. Pores medium, numerous, in groups of twos and threes, giving a mottled appearance on a longitudinal section. Rays extremely fine and indistinct. Rings not seen. Sapwood white.

W. = 50 lbs. P. = 840.

The wood is very good and handsome, but is little known. Unfortunately, it cannot be obtained in broad pieces. It is used, especially in North Travancore.

2. **P. reticulatum**. W. and A. Fl. Br. Ind. i. 369. Bedd. Fl. Syl. xxxiv. Gamble Man. Tim. 100. Tam. *Muli polavu*: *thólpuli*, Mal. *Mala vúrm.* 85

Leaves deeply-lobed on young plants, cuneate, acuminate on the older. 3-4 in. by $1\frac{1}{2}$-2 in., dark-green above, white beneath. Petiole $\frac{1}{4}$ in. Flowers white, $1\frac{1}{2}$ in. across, 2 or 3 together. Capsule 2-3 in. long, and $1\frac{1}{2}$ in. diam., covered with brown tomentum.

A handsome tree common through the evergreen forests of Travancore at low elevations, and frequently planted along road sides.

Height 80 ft. Diam. 2 ft. Occurs also in Malabar.

Flowers from March—May. Fruits Dec.--Feb.

Bark pale brown, rough, $\frac{1}{8}$ in. thick. Wood reddish-brown streaked darker, moderately hard, rather rough. Pores small, even, often in pairs. Rays very fine and numerous, crossed by transverse lines Annual rings not seen.

W. = 43 lbs. P = 603.

The wood is sometimes cut for boats, but it is not much used.

3. **P. glabrescens**. W. and A. Fl. Br. Ind. i. 369. Bedd. Fl. Syl. xxxiv. Gamble Man. Tim. 102. Tam. *Vatta polavu*. Mal. *Pámbaram.* 86

Leaves deeply cut in young plants, on long petioles; when old rectangular-obovate 6-12 in. by 5-10 in. dark-green above, white or buff below. Petiole $\frac{1}{2}$ in. Flowers white, 6 in. long, one or two together. Capsule brown, ribbed, 5 in. by 1 in.

A medium-sized tree of handsome appearance, with horizontal branches, occuring in evergreen forests between 1,000-2,000 ft but not common. Height 60 ft. Diam. $1\frac{1}{2}$ ft. Occurs also in Malabar and Tinnevelly.

Flowers in Aug.—Sept. Fruits Feb.—April.

Bark green and brown, rather smooth. $\frac{1}{4}$ in. thick. No heart. Wood pale, darkening to red with exposure, soft and weak, with a short fibre. Pores moderate-sized, often divided. Rays very numerous and fine.

W. = 34 lbs. P = 436.

The wood is of no value, but the tree is worth planting for its handsome appearance. It grows fast.

5. GUAZUMA. Plum.

A tree with simple, tomentose leaves. Flowers regular, bisexual, in axillary cymes. Sepals 5, connate at base. Petals 5, prolonged at the appex into 2 narrow processes. Staminal column short, bearing 15 anthers and 5 lanceolate staminodes. Ovary 5-celled, with several ovules in each cell. Fruit a woody, tubercled capsule.

87 **G. tomentosa.** Kunth. Fl. Br. Ind. i. 375. Bedd. Fl. Syl. t. 107. Gamble Man. Tim. 104. Eng. *The Bastard Cedar*, Mal. *Uttharisham.*

Leaves lanceolate, serrate, acuminate, on short petioles. unequal at the base. scabrid above, pubescent beneath, 3-4 in. by 1¼- 2 in. Petiole ¼ in. Flowers yellow. ¼ in. long. Fruit a black, tubercled, ovoid capsule about 1 in. long.

A small tree 30 ft. high and 1 ft. diam. not indigenous in Travancore, but run wild. A native of America.

Flowers in May—June. Fruits December—January.

Gamble says that the wood is light-brown, soft and even-grained, and gives

W. = 38 lbs. P. = 596.

Elsewhere, it is used for furniture, and the leaves for cattle-fodder. Children eat the fruit. The branches yield a fibre and the inner bark is used medicinally. The tree is planted as an avenue tree and is cultivated in gardens.

6. LEPTONYCHIA. Turcz.

Small trees with simple, entire leaves. Flowers regular, bisexual in axillary cymes. Sepals 5, valvate, connate at the base. Petals 5, valvate. Staminal column tubular below with filaments above in 3 series, the middle carrying 10 stamens, the inner and outer series with staminodes. Ovary 3-4-celled with many ovules. Fruit a 1-3-celled capsule with black seeds in an orange coloured aril.

88 **L. moacurroides.** Bedd. Fl. Br. Ind. i. 379. Bedd. Fl. Syl, t. 114. Gamble Man. Tim. 105.

Leaves oblong, acuminate, base rounded, glabrous on both sides. 3-nerved at base, 3-4 in. by 1½-2 in. Petiole ½ in. Flowers few, about ½ in. long and broad, yellow. Capsule tubercled, ¾ in. long and broad, obovoid and 2-valved. Seeds many.

A small tree up to 30 ft high and 6 in diam very common in our evergreen forests between 1000-3000 ft It is found also in Tinnevelly and other parts of the Madras Presidency.

Nothing is known of its timber of the uses to which it could be put.

ORDER XV. TILIACEAE.

Trees with alternate, simple or lobed leaves, and caducous stipules. Flowers regular, bisexual. Sepals 3,5, valvate, free or connate. Petals 3-5, imbricate or valvate. Stamens numerous, free, anthers 2-celled. Ovary free, 2-5-celled. Ovules few or many. Fruit a capsule, or a drupe with 1-4 stones. Seeds without an aril.

An important Order containing about 10 trees wild in Travancore, most of them of medium-size, but some supplying useful timber. To this Order belongs the "Lime" tree or "Linden" of Europe, *Tilia europœa*, and *Corchorus capsularis*, the plant which yields the "Jute" of commerce, and is largely planted in Bengal.

Petals entire, twisted in bud. Anthers opening by slits.
  Sepals combined into a cup. Fruit dry . . 1. *Berrya*.
  Sepals distinct. Fruit fleshy . . . 2. *Grewia*.
Petals fringed, not twisted in bud. Anthers opening by a terminal pore 3. . *Elæocarpus*.

1. BERRYA. Roxb.

A tree with ovate, cordate leaves, 5-7-nerved. Flowers in terminal panicles. Calyx irregularly 3-5-lobed, campanulate. Petals 5. Stamens on a short torus without staminodes. Ovary 3-celled with 4 govules in each cell. Fruit a 3 valved capsule with 2 wings to each valve.

B. Ammonilla. Roxb. Fl. Br. Ind. i. 383. Bedd. Fl. Syl. t. 58 89
Trimen Fl. Cey. i. 173. Gamble Man. Tim. 107. Eng. *The Trincomalee-wood tree.*

Leaves entire but undulate, bright-green, 4-8 in. by 2-3 in. Petiole 1-2 in. Flowers numerous, white, $\frac{2}{3}$ in. across. Capsule $\frac{1}{2}$ in. long. surrounded by 6 papery wings, 1 in. long. Seeds angular, covered with yellow hair.

A large tree of handsome appearance, said to have been found in Travancore, but I have not seen it. It occurs in Ceylon, Burmah and the Andaman Islands, and has been planted in the Madras Presidency. It is confined to the forests of the dry country everywhere.

Flowers and fruits from January—March.

Gamble says that the heartwood is dark-red, very hard and close-grained, but apt to split. It is one of the best Ceylon woods, and is exported from that Island to Madras, and the average of the experiments he quotes is

W. = 56 lbs. P. = 826.

It is used for carts, agricultural implements and boats, and is esteemed for its toughness and flexibility.

2. GREWIA. Linn.

Small trees with simple, entire, 3-5-nerved leaves. Flowers axillary, few. Sepals 5, distinct, equal, coloured inside. Petals 5, clawed. Stamens numerous, on a raised torus. Staminodes 0. Ovary 2-4-celled. Fruit a drupe with 1-4 stones.

Leaves hoary beneath. Drupes usually globose.
  Stipules subulate, acuminate . . 1. *G. salvifolia*.
  Stipules leafy, auricled . . 2. *G. tiliæfolia*.
Leaves not hoary. Drupes usually didymous . 3. *G. lævigata*.

1. **G. salvifolia.** Heyne. Fl. Br. Ind. i. 386. Bedd. Fl. Syl. 90
xxxvii. Brandis For. Fl. 43. Gamble Man. Tim. 55. Tam. *Savandil únam.*

Leaves serrate, lanceolate, 2-3 in. by 1-1½ in. 3 nerved at the base, very white beneath. Petiole ¼ in. Stipules 1⅓ in. Flowers few, yellow, conspicuous, about ½ in. across. Drupe the size of a pea, globose, sometimes lobed.

A medium-sized tree only found in the dry forests near Shencottah at 1000 ft. elevation, rare. Height 40 ft. Diam. 1½ ft. Occurs also in North India and Africa, but not in Ceylon.

Flowers in February-March. Fruits in September.

Gamble says that the bark is rough, the wood is yellow, and the heart-wood orange-brown, hard and close-grained and like that of *G. tiliæfolia*, but that the rays are more numerous and pores smaller. Annual rings well-marked. "Growth slow. Fruit small, edible."

91 2. **G. tiliæfolia.*** Vahl. Fl. Br. Ind. i. 386. Bedd. Fl. Syl. t. 108. Brandis For. Fl. 41. Trimen Fl. Cey. i. 175. Gamble Man. Tim. 109. Tam. *Unam : únu.* Mal. *Chadicha.*

Leaves serrate, obliquely ovate, 2½-5 in. by 1½-3 in., 3-5 nerved at base. Petiole ½-1 in. Stipules auricled, ½ in. long. Flowers 3-10 together, yellow, about ⅓ in. across. Drupe rather larger than a pea, white turning to reddish-purple.

A medium-sized tree very common in all grass land, and near the edges of evergreen forest, at elevations from 100-3000 ft. throughout Travancore. Height 40 ft. Diam 1½ ft. Occurs also through India, in Burmah, Ceylon and East Africa.

Flowers from February-April. Fruits in May-June.

Bark blackish-brown, very rough, ⅜ in. thick. Sapwood white, heart pale-brown, very elastic, moderately hard straight-grained with a long fibre. Pores medium, numerous, evenly distributed, larger in the spring-wood. Rays very fine, giving a handsome silver grain. Annual rings distinct, 4 to inch.

W. = 46 lbs. P. = 766.

The fruit is eaten. The wood is much used for shafts, masts, oars and axe-handles, and is valued for its elasticity and strength.

92 3. **G lævigata.** Vahl. Fl. Br. Ind. i 389. Bedd. Fl. Syl. xxxvii. Brandis For. Fl. 42. Gam. Man. Tim. 111.

Leaves serrate, ovate or lanceolate, 3-6 in. by 1½-2½ in., 3-nerved at base. Stipules ⅓ in. Petiole ½ in. Flowers few, yellowish-white. ½ in. across. Drupe distinctly lobed, greenish-black, each lobe the size of a pea.

A medium-sized tree, common in all open forests throughout Travancore from 0-3000 ft. Height 30 ft. Diam. 1 ft. Occurs also through India, in Tropical Africa and Australia.

Flowers in July-September. Fruits October-December.

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* Note.—Brandis in his "Indian Trees" pp. 98 and 100, makes 2 species out of this tree, viz. *G. asiatica* and *G. leptopetala* both occurring in Travancore, the petals of the former with, and of the latter without, a distinct claw. The occurrence and distribution of these two species must be studied.

Brandis says that the wood is white, even, close-grained and elastic, without a distinct heart. It is not used with us. Gamble describes it as soft to moderately hard, and gives

W. = 36 lbs.

In addition to the above, there are several species of shrubby *Grewias* in our forests which are too small to be noted here.

3. ELÆOCARPUS. Linn.

Trees with simple, often glandular, leaves. turning bright-red as they wither. Flowers pendulous in axillary racemes. Sepals 5, free. Petals 5, fringed, inserted round the base of the glandular disk. Stamens 20-80, inserted on the disk between the glands. Anthers linear, opening by a terminal pore. Ovary sessile, 1-3-celled with 2 or more ovules in each. Style simple. Fruit a drupe, with a bony 1-3 celled, tubercled stone.

Anthers not or scarcely prolonged at the apex.
- Anthers tipped with hairs . . 1. *E. serratus.*
- Anthers without any hairs . . 2. *E. oblongus.*

Anthers terminating in a long awn.
- Anther tails erect.
  - Leaves glabrous, exceeding 5 in. Stamens 60-80. 3. *E. tuberculatus.*
  - Leaves glabrous, less than 5 in. Stamens 30-40. 4. *E. venustus.*
  - Leaves covered with red down. Stamens 20. 5. *E. ferrugineus.*
- Anther tails reflexed. 6. *E. Munroii.*

1. **E. serratus.** Linn. Fl. Br. Ind. i. 401. Bedd. Fl. Syl. 93
xxxviii. Trimen Fl. Cey. i 184. Gamble Man Tim. 114 Eng. *The wild Olive tree.* Tam. *Olang kirei.* Mal. *Nall kára :—valya kára: kára mavu.*

Leaves oval, crenate-serrate, glabrous. 2-5 in. by 1-2 in. Petioles $\frac{1}{2}$-1 in. Flowers white, $\frac{1}{2}$ in. across, in 2-4 in. racemes. Stamens 20-30. Anthers tipped with hairs. Drupe green, ovoid about 1 in. long. Stone 1-seeded. An exceedingly common and very ornamental tree, especially when in flower, found at all elevations in evergreen forests, from sea-level to 5000 ft. Height 60 ft. Diam. $1\frac{1}{2}$ ft. Occurs also in South India, Java and Ceylon.

Flowers in January-March and again in July-September. Fruits about 4 months later.

Bark grey, smooth, $\frac{1}{3}$ in. thick. Wood greyish-white, rather soft and coarse. Pores of moderate size, evenly distributed. Rays fine and close. Annual rings indistinctly marked by dark lines.

W = 33 lb. P = 508.

The wood is useless, but the fruit may be eaten.

2. **E. oblongus.** Gœrtn. Fl. Br. Ind. i. 403. Bedd. Fl. Syl. 94
xxxviii. Gamble Man. Tim. 114. Mal. *Katta kára: Malam kára.*

Leaves ovate, with a few, shallow serratures, glabrous, 3-5 in. by 2-$3\frac{1}{2}$ in. Petiole $\frac{3}{4}$-$1\frac{1}{2}$ in.

Flowers white, $\frac{1}{2}$ in. across, on 4- in. racemes. Stamens 20-30: anthers without hairs. Drupe green, globose, $1\frac{1}{4}$ in. diam, with a 1-seeded stone.

A fairly common but local tree, bearing a strong resemblance to the last, but with broader, darker and thinner leaves with fewer veins. The fruit also is rounder and is not edible. Seen at low elevations about Kulattupuzha, and Kallar from 300-1800 ft. Height 60 ft. Diam. 2 ft. Occurs also in Burmah, Malaya and Borneo, but not in Ceylon.

Flowers in March-April. Fruits in June-July.

Beddome says that the wood is white, strong and tough, and is esteemed on the Neilgherries,

95 3. **E. tuberculatus.** Roxb. Fl. Br. Ind. i. 404, Bedd. Fl. Syl. t. 113. Gamble Man. Tim. 115. Tam. *Rutthrácham* Mal. *Piláhi: naggara: koda vási: ammakkaram*

Leaves serrulate, obovate, base cuneate, 4-12 in. by 3-5 in., glabrous and dark-green above, beneath pale, with tomentose nerves. Petiole 1-2 in. Flowers white, fragrant, 1 in. across, in erect 3-in. racemes. Stamens 60-80; anthers each terminating in a long straight bristle. Ovary 2-celled with about 8 ovules in each. Drupe ovoid, green, 2 in. long, stone 1-2-celled.

A large tree, very common throughout Travancore from 0-5000 ft, in evergreen forest and on river banks, conspicuous by its beautiful flowers. Height 80 ft. Diam. $2\frac{1}{2}$ ft. Found also in Malabar, Pegu and Java.

Flowers in December-January. Fruits in July-August.

Bark mottled, grey and white, $\frac{1}{2}$ in. thick. Sapwood white. Heart brown, prettily streaked with darker colour, smooth, and moderately hard. Pores medium, numerous, often 2-3 together, in short radial lines. Rays extremely fine and close. Annual rings marked by dark lines about 2 to the inch.

$$W = 33 \text{ lbs.} \quad P = 460.$$

The wood is not used.

96 4. **E. venustus.** Bedd. Fl. Br. Ind. i. 405. Bedd. Fl. Syl. t. 174. Gamble Man. Tim. 115.

Leaves oblong or obovate, narrowed to the base, serrulate, glabrous, 3-4 in. by $1\frac{1}{2}$-2 in., with large glands on the primary veins. Petiole $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers white, fragrant, 1 in. across, in axillary racemes about 4 in. long, each flower on pedicels 1-$1\frac{1}{4}$ in. long. Stamens about 30: anther-tails very short. Ovary 2-celled with 6 ovules. Drupe ovoid, about 2 in. by 1 in., hanging on 2-3 in. peduncles from the old wood.

A large and handsome tree found by Beddome, and subsequently by me, at Mutthu Kuli Vayal and Chimunji in South Travancore, at an elevation of 3,500-4,500 ft. It has not been seen elsewhere. Height 50 ft. Diam. $1\frac{1}{2}$ ft. Flowers in August. Fruits in April-May. Nothing is known of the tree or its uses. It is well worth cultivating in gardens for ornament.

97 5. **E. ferrugineus.** Wight Fl. Br. Ind. i. 406. Bedd. Fl. Syl. t. 112. Gamble Man. Tim. 115.

Leaves ovate, serrulate, convex above, covered with rusty down beneath. 3-6 in by $\frac{3}{4}$-2 in. Petiole 1-2 in. Flowers white, $\frac{1}{2}$ in. across, in short axillary racemes. Stamens about 20 : anthers terminating in a straight bristle. Ovary 3-celled with 6-8 ovules. Drupe ovoid, smooth, $\frac{1}{2}$ in. long.

A medium-sized tree confined to the higher elevations, above 5 000 ft. I have only seen it on the High Range Height 40 ft. Diam. 1 ft. Occurs also on the Neilgherries, Anamallays and Palneys.

Beddome says that the timber is used for building purposes.

6. **E. Munroii**. Mast. Fl. Br. Ind. i. 407. Bedd. Fl. Syl. xxxviii. (under *E- glandulifera* Hooker). Trimen Fl. Cey. i. 187. Gamble Man. Tim. 115. Mal. *Pungári*. 98

Leaves serrated, cuneate-obovate, acuminate, glabrous, 2-3 in. by $\frac{3}{4}$-1 in Petiole slender, 1-2 in. Flowers white, $\frac{1}{2}$ in. across, in short drooping racemes. Stamens 20 : one anther terminating in a long awn which becomes reflexed. Ovary 2-celled. Drupe ovoid, blue, $\frac{1}{2}$ in. long.

A very handsome tree abundant on the hills through Travancore at elevations between 2000 and 6000 ft. very conspicuous when in flower. Height 70 ft. Diam, 1$\frac{1}{2}$ ft. Found elsewhere in Malabar and the hills of South India,

Flowers in September-October. Fruits in March-April.

Beddome says that the timber is white with a brownish heart. Gamble says "wood white, moderately hard."

DISCIFLORÆ

ORDER XVI. LINEÆ.

Herbs, shrubs or small trees with alternate, simple, usually entire leaves. Flowers regular, bisexual. Sepals and petals 5, imbricate. Stamens 4-5 alternating with 4-5 staminodes, or 8-10 fertile, filaments united into a ring at the base. Glands 5. Ovary 3 or 5-celled with 1 or 2 ovules in each. Fruit a capsule or drupe.

An order of no importance to the Forest Officer as it contains only one tree which occurs in Travancore. To it belong *Linum usitatissimum* the "Flax" plant of Europe, and *Erythroxylon coca* which yields the well known "Coca" or "Spadic" of South America, from which the drug "Cocaine" is prepared.

ERYTHROXYLON Linn.

Trees and shrubs with glabrous, entire leaves, and small axillary flowers. Sepals and petals 5. Stamens 10, connate into a tube. Ovary 3-celled with 1 ovule in each cell. Styles 3. Fruit a drupe, 1-3 celled, 1 seeded.

E. monogynum. Roxb. Fl. Br Ind. i. 414. Bedd. Fl. Syl. t. 81 (under *E. indicum*). Trimen Fl. Cey. i. 190. Gamble Man. Tim. 116. Tam. *Dévadáram*. 99

Leaves obovate, cuneate, reticulated, with stipules combined, 1-2⅓ in. by ½-¾ in. Flowers white, few, generally solitary, ¼ in. across. Drupe oblong, smooth, somewhat three-cornered, ⅜ in. long, bright scarlet.

A small tree found on the hills of Travancore at an elevation of 1000-3000 ft., above Acchankovil and near the Ponmudi Sanitarium. Beddome calls it the "Bastard Sandal." It occurs in the hill-forests of this Presidency and in Ceylon, chiefly in the drier parts. Height 25 ft. Diam 6 in.

Trimen says that it flowers in August and that the heart-wood is very hard, heavy, smooth and dark-brown, with a pleasant, resinous scent, and that it yields, by distillation, a kind of tar, used for preserving the wood of boats.

ORDER XVII. GERANIACEÆ.

Herbs, shrubs, or trees with opposite or alternate leaves, simple or compound. Flowers bisexual, regular or irregular. Sepals 3 or 5, distinct, imbricate, one often spurred. Petals as many as sepals or 0, imbricate. Stamens 5 or 10, free or connate. Ovary 5 celled with few or many ovules. Fruit a capsule or drupe.

An Order of no importance, consisting chiefly of handsome flowering shrubs, geraniums and balsams, and including only 2 trees of the genus *Averrhoa* common in Travancore, though not indigenous, which are cultivated for their fruit and have run wild. These are

Leaflets 5-11, glabrous beneath	*A. Carambola.*
Leaflets 10-20, pubescent beneath	*A. Bilimbi.*

The former is called "Pulachi" and the latter "Bilimbi." The fruit of both of them is acid, and may be pickled or made into preserves.

ORDER XVIII. RUTACEÆ.

Trees or shrubs with alternate or opposite, compound, (rarely simple), leaves without stipules, gland-dotted, aromatic, and often spinous. Flowers regular, unisexual or bisexual. Sepals 4 or 5, more or less connate, imbricate. Petals 4 or 5, distinct, imbricate or valvate. Stamens 4-5 or 8-10 (many in *Citrus* or *Œgle*), free, rarely monadelphous. Disk annular. Ovary often raised on a gynophore, 2-7-celled with 1 or 2 ovules in each (many in *Citrus*, *Œgle* and *Feronia*). Fruit a berry, or dry and divided into cocci.

An important economic order, but of little value to the Forester, as it chiefly contains small trees, about 16 of which are wild in Travancore.

Flowers polygamous or unisexual.
  Fruit of distinct, dehiscent cocci
    Leaves opposite, 3 foliolate, Stem unarmed .. 1. *Evodia*,
    Leaves alternate, pinnate. Stem armed .. 2. *Zanthoxylum*.
  Fruit syncarpous, indehiscent.
    Leaves 3-foliolate. Stamens 6 .. 3. *Toddalia*
    Leaves simple. Stamens 8. .. 4. *Acronychia*.

Flowers bisexual
Ovules solitary or 2 in each cell
Unarmed. Leaves pinnate
Ovules solitary in each cell .. 5. *Glycosmis.*
Ovules 2 in each cell (1 in M *Kœnigii*)
Flowers solitary or cymose,—large. Style long 6. *Murraya,*
Flowers in panicles or racemes, small, Style short 7. *Clausena.*
Armed. Leaves simple .. 8 *Atalantia.*
Ovules numerous in each cell.
Leaves simple. Stamens 20-60 .. 9. *Citrus.*
Leaves pinnate. Stamens 10-12 .. 10. *Feronia.*
Leaves 3-foliolate. Stamens 30-60 .. 11. *Œgle.*

1. EVODIA. Forst.

Unarmed trees with glabrous, opposite, trifoliolate leaves. Flowers unisexual, in axillary panicles. Sepals 4-5. Petals 4-5, valvate. Stamens 4-5. Ovary 4-lobed, 4 celled with 2 ovules in each cell. Fruit of 1-4 distinct cocci, splitting into two valves.

E. Roxburghiana. Benth. Fl. Br. Ind. i. 487. Bedd. Fl. Syl. xli. (under *E. triphulla*) Trimen Fl. Cey. i 214. Gamble Man. Tim. 120. Mal. *Kanalei: kátta shambagam.* 100

Leaflets sub-sessile, entire, oval, tapering at both ends, 2½-4 in. by 1½-2 in. Petiole about 4 in. Flowers very numerous, greenish-yellow, ⅛ in. across Cocci ovoid, brown, ¼ in. long, containing one black seed. A very common tree of medium or small size, found in evergreen and secondary forest from sea level to 4000 ft. throughout Travancore Height 40 ft. Diam. 1½ ft. Occurs also in Malabar and in many parts of India, Ceylon and Java.

Flowers in June-July. Fruits in October-December.

Bark smooth, grey, covered with lenticels, ⅓ in. thick. Wood greyish-white, rather smooth, moderately hard, with no heart. Pores small and numerous. Rays very fine. Annual rings not easily seen. Gamble gives 9 rings per inch.

W=27 lbs. P=368.

The wood is not used.

2. ZANTHOXYLUM. Linn.

Spinous trees with alternate leaves. Flowers, unisexual, in terminal cymes. Sepals 4. Petals 4, valvate Stamens 4. Ovary 4-celled with 2 ovules in each cell. Fruit of 1-4 distinct, 1-seeded cocci.

Z. Rhetsa. D. C. Fl. Br. Ind. i. 495. Bedd. Fl. Syl. xli. Gamble Man. Tim 123. Eng. *The Indian prickly ash.* Mal. *Kátta murrukku: mullillum.* 101

Leaves pinnate, of 8-20 pairs of very oblique leaflets, about 1½ ft long, each leaflet entire, glabrous, lanceolate, acuminate, about 5 in by 1 in Stem and branches covered with spines. Flowers greenish-yellow, ⅛ in. across, numerous Cocci purplish-green, aromatic, gland-dotted, the size of a pea. Seeds black.

A deciduous tree of medium size, found in evergreen forests throughout Travancore at low elevations, but nowhere common. Height 50 ft. Diam. $1\frac{1}{2}$ ft. Occurs also in Malabar and the Eastern Ghats, but is not found in Ceylon.

Flowers June-November. Fruits in October-January,

Bark thick and rough, with long conical spines, $1\frac{1}{2}$-2 in. long. Gamble says that the wood is yellowish-grey and moderately hard, and that the annual rings are distinctly marked by the darker autumn wood with few pores, and gives.

W=40 lbs.

No use is made of the timber or any part of the tree. Its seeds are very pungent. Elsewhere an oil is obtained from the carpels which is used for cholera and rheumatism. The bark also is aromatic and is pickled.

3. TODDALIA. Juss.

Armed or unarmed trees and shrubs with trifoliolate leaves. Flowers unisexual, in axillary and terminal panicles. Calyx 0, or 2-5 lobed. Petals 2-5. Stamens 2-6. Ovary 2-5 celled with 2 ovules in each cell. Fruit a berry.

102 **T. bilocularis.** W. and A. Fl. Br. Ind. i. 497. Bedd. Fl. Syl. xliii. Gamble Man. Tim. 123.

Leaflets sub-sessile, lanceolate or ovate, 3-10 in. by $1\frac{1}{2}$-4 in. glabrous, entire, yellow when young, dark-green when old. Petiole 3-4 in. Flowers diœcious, yellowish green, $\frac{1}{4}$ in. across. Calyx 0. Petals 2-3. Stamens 6. Berry globose, 2-celled, gland-dotted, the size of a cherry.

A very handsome, unarmed, lofty, evergreen tree, found in the evergreen forests throughout travancore between 500 and 4000 ft. but nowhere common. The bright-yellow immature leaves are conspicuous. Height 80 ft. Diam. 2 ft. Occurs elsewhere only in Malabar and on the West Coast.

Flowers January-April. Fruits May-June.
Nothing is known of the timber.

T. aculeata Pers. with a thorny stem and lobed calyx is a very common shrub.

4. ACRONYCHIA. Forst.

Unarmed trees with opposite or alternate, simple, entire leaves. Flowers polygamous, in loose, axillary corymbs. Sepals 4, connate. Petals 4, valvate. Stamens 8, alternately long and short. Disk. large. Ovary 4-celled with 2 ovules in each cell. Fruit a berry with 1-4 seeds.

103 **A. laurifolia.** Blume. Fl. Br. Ind. i. 498. Bedd. Fl. Syl. xlii (under *A. pedunculata*) Trimen, Fl Cey i 216. Gamble Man. Tim. 124. Tam. *Mutta niri* Mal. *Vidu kanalei*.

Leaves dark-green, glabrous and shining, oval, 3-5 in. by $1\frac{1}{2}$-2 in. Petiole $\frac{1}{2}$-1 in. Flowers creamy-white, scented, $\frac{1}{3}$ in. across, in corymbs about 5 in. long. Fruit globose, $\frac{2}{3}$ in. diam. pale-brown. often beaked.

A small evergreen tree, very common in all open forests from sea level up to 4,000 ft. through Travancore. Height 30 ft. Diam. 9 in. Widely spread through India, Burma, Ceylon and Java.

Flowers in May-June and September-October Fruits July-August and December-January.

Gamble says that the wood is greyish-white, smooth, and moderately hard, and gives.

W. = 47 lbs.

Trimen says that the bark is applied to sores and ulcers.

5. **GLYCOSMIS.** Corr.

Small unarmed trees with odd-pinnate leaves. Flowers bisexual, in axillary and terminal panicles. Sepals 5, distinct, imbricate. Petals 5, imbricate. Stamens 10 long and short. Ovary on a gynophore, 2-5-celled with 1 ovule in each cell. Style short. Fruit a 1-3 seeded berry.

G. **pentaphylla.** Corr. Fl. Br. Ind. i. 499. Bedd. Fl. Syl. 104
xliii. Brandis For Fl. 49. Trimen Fl. Cey. i. 217. Gamble Man. Tim. 225. Mal. *Panal.*

Leaves of 3-5 oblong, pale green leaflets, acute at base, entire or slightly denticulate, each 2-5 in. by 1 in. Flowers $\frac{1}{3}$ in. across, white, scented, in erect panicles. Berry globose, apiculate, $\frac{3}{8}$ in. diam , smooth, pinkish-white. Seeds 1 or 2.

A small tree, or more generally a bush, very common in all waste places at low elevations through Travancore. Height 20 ft. Diam. 6 in. Occurs through India, Ceylon, Malaya and China.

Flowers and fruits throughout the year.

Gamble says that the woods is white, hard and close-grained No use is made of the tree.

6, **MURRAYA.** Linn.

Small unarmed trees with alternate odd-pinnate leaves. Flowers large, bisexual, cymose. Sepals 5, nearly distinct. Petals 5, imbricate or valvate. Stamens 10, long and short, filaments linear. Ovary 2-5-celled with 1 or 2 ovules in each cell. Fruit a berry with 1 or 2 seeds.

Leaflets glabrous, 3-7. Petals imbricate. Berry red .. 1. *M. exotica.*
Leaflets pubescent, 11-25. Petals valvate. Berry black 2. *M. Kœnigii.*

1. **M. exotica.** Linn. Fl. Br. Ind. i. 502. Bedd. Fl. Syl. xliv. 105
Brandis For Fl 48 Trimen Fl. Cey. i. 219. Gamble Man. Tim. 125 Eng. *The China box.*

Leaves of 3-7 leaflets, each 1-3 in. long by $\frac{1}{2}$-1 in., very glabrous, oval, often oblique at base. Flowers white, very fragrant, 1-4 together $\frac{3}{4}$ in. across. Berry ovoid, red, smooth, 1-celled and 1-2-seeded, about $\frac{3}{4}$ in. long.

A small tree or large bush common in the evergreen forests near Puliyara and elsewhere through Travancore, between 0 and 4000 ft.

elevation. Frequently cultivated in gardens for its pretty foliage and sweet flowers Height 20 ft. Diam. 6 in. Occurs through India and in Ceylon, China and Australia.

Flowers in May-September. Fruits October-February.

Gamble says that the wood is "light-yellow, like boxwood, close-grained, very hard and apt to crack" and that it has been used for wood-engraving and the handles of tools, and he gives

W = 62 lbs.

106 2. **M Koenigii**. Spreng. Fl. Br. Ind. i. 503. Bedd. Fl. Syl. xliv. Brandis For Fl. 48. Trimen Fl. Cey. i. 220. Gamble Man. Tim. 126. Tam *Kätta veppilei*.

Leaves of 11-25 sessile leaflets, oblique, crenate, pubescent beneath, each 1-2 in long. Flowers white, fragrant, numerous, ½ in. across. in terminal cymes Berry ovoid, black, ⅓ in. long, containing 2 seeds imbedded in mucilage.

A small tree occuring in the evergreen forests of Travancore from 0-3000 ft, local and rare. Cultivated for its leaves which are used in curries. Height 25 ft. Diam. 8 in. Occurs throughout India and in Ceylon.

Flowers in February-April. Fruits from June-August.

Gamble says that the wood is hard and greyish-white, and is durable, and that it is used for agricultural implements, and he gives

W. = 43 lbs.

The bark, root and leaves are used medicinally.

7. CLAUSENA. Burm.

Small unarmed trees with alternate, odd-pinnate leaves. Flowers bisexual in racemes or panicles. Sepals and petals 4-5. Stamens 8-10, inserted round a disk, long and short alternately, filaments dilated. Ovary stipitate, 2-4-celled, with 2 ovules in each. Style short, deciduous. Fruit a berry with 1 or 2 seeds.

Flowers 5-merous in terminal panicles .. . 1. *C. indica*.
Flowers 4-merous in axillary racemes .. . 2. *C. Willdenovii*.

107 1. **C. indica**. Oliv. Fl. Br. Ind. i. 505. Bedd. Fl. Syl. xlv Trimen Fl. Cey. i. 221. Gamble Man. Tim. 126. Tam. ***Kariveppilei***. Mal. *Gorakotta*.

Leaves 6-12 in. long, of 7-17 glabrous, subsessile, leaflets, which are ovate-lanceolate, 2-4 in. by 1-1½ in, oblique, faintly crenate. Flowers small, ⅓ in across, pale-green in terminal panicles Sepals and petals 5. Stamens 10. Berry globose ⅓ in, smooth, cream-coloured, containing 1 green seed.

A small tree of the evergreen forests, especially in parts with a lighter rainfall at elevations between 3000-5000 ft. rare. Height 25 ft Diam. 8 in. Occurs also in Malabar and Ceylon.

Flowers in January-March. Fruit in April-June.

The fruit is said to be edible.

2. C. Willdenovii. W. and A. Fl. Br. Ind. i 506. Bedd. Fl. Syl. xliv Trimen Fl. Cey. i. 222. Gamble Man. Tim. 127. Tam *Potti Kora katta.* 108

Leaves fragrant, 6-18 in. long, with 7-15, almost sessile, oblique, leaflets finely crenate and very thin, each 2-4 in by 1-1½ in. Flowers white fragrant, ⅓ in across, in axillary racemes 6 in. long. Sepals and petals 4. Stamens 8 Berry ovoid, smooth, greenish-white, ½ in. diam., containing 1-2 seeds immersed in mucilage.

A small tree common in the evergreen forests near Ariyankavu, and on the Cardamom Hills between 1000-4000 ft., where the rainfall is light, not found in regions of heavier rainfall. Bare of leaves in March. Height 30 ft. Diam. 9 in. Occurs also in Malabar, N. India and Ceylon. Flowers appear with the young leaves in April and May. Fruits in May-June.

Bark black, rough and ¼ in. thick. Wood white, hard and close-grained, but of small size. No heart.

W. = 66 lbs. P. = 756.

I agree with Beddome that the fruit, which very much resembles a grape, is very delicious, and is well worthy of attention. I have tried to grow the tree at Quilon, but it does not seem to thrive in the plains.

8. ATALANTIA. Corr.

Small trees usually armed with straight axillary spines. Leaves alternate, simple. Flowers bisexual, axillary. Calyx 3-5-lobed. Petals 3-5, imbricate Stamens 8-10, distinct or united. Disk annular Ovary 2-or 4-or 5-celled, with 1 or 2 ovules in each. Fruit a berry.

Stamens combined into a tube.
- Flowers in umbels. Calyx irregularly lobed .. 1. *A. monophylla.*
- Flowers in racemes. Calyx regularly lobed .. 2. *A racemosa.*

Stamens distinct.
- Leaves veined. Filaments flat. Ovary sessile .. 3. *A. zeylanica.*
- Leaves veinless. Filaments slender. Ovary stipitate .. 4. *A. missionis.*

1. A. monophylla. Corr. Fl. Br. Ind. i. 511. Bedd. Fl. Syl. xlvi. Trimen Fl. Cey. i. 226. Gamble Man. Tim. 129. 109

Leaves glabrous, entire, ovate oblong, deeply divided at the apex, acute at base, ½-1½ in. by 1-3 in. Branches armed with short spines. Flowers white, long-pedicelled, ½ in. across in axillary umbels. Berry globose, pointed, greenish-yellow, ¾ in. diam, 4-celled and 4-seeded.

A small tree, probably occurring in the drier forests of Travancore, though I have not observed it. Occurs also in Silhet, Malabar, on the East Coast and in Ceylon.

Flowers August-December. Fruit February-April.

Gamble says that the wood is yellow, very hard and close-grained, and is suited for cabinet-work and turning. He gives

W. = 60 lbs.

According to the Pharmacographia Indica a pleasant sweet-smelling oil is expressed from the seeds, which is used in rheumatism and paralysis.

110 2. A. **racemosa.** W. and A. Fl. Br. Ind. i. 512. Bedd Fl. Syl. xlvi. Trimen Fl. Cey. i. 226. Gamble Man. Tim. 129. Tam. *Kátta naragam.*

Leaves glabrous, ovate-oblong, divided at the apex, narrowed to the base, ½-3 in. by ½-1⅓ in. Flowers white, ½ in. across, on short pedicels, in axillary racemes 2-3 in long. Berry globose, pointed, greenish-yellow, ¾ in diam, 4-celled and 4-seeded.

A small tree armed with straight spines or unarmed, common in our evergreen forests at 2000-3000 ft. Height 30 ft. Diam. 8 in. Occurs also in Malabar and Ceylon.

Flowers November-January. Fruits April-June.

111 3. A. **zeylanica.** Oliv. Fl. Br. Ind. i. 512. Bedd. Fl. Syl. xlvi. Trimen Fl Syl i. 227. Gamble Man. Tim 129.

Leaves veined, oval, oblong, glabrous, notched or obtuse at the apex, rounded at the base, 1-4 in. by ½-1½ in. Flowers white, in very short racemes (less than 1 in) Berry globular-ovoid. ½-¾ in. long, 2-4 seeded.

A small tree armed with straight spines or unarmed, found in our evergreen forests at low elevations. Occurs also in Malabar. South India and Ceylon.

Flowers in November-January. Fruits April-May.

112 4. A. **missionis.** Oliv. Fl. Br. Ind. i. 513. Beed. Fl. Syl. xlvi. Trimen Fl. Cey. i 227. Gamble Man. Tim. 129.

Leaves veinless, oval-oblong, obtuse at apex, glabrous, entire or undulate, 2½-4 in. by 1-1½ in. Flowers white, fragrant, ½ in. acr ss, in erect panicles 1-3 in. long. Berry globose, 1 in. diam., yellow, with 4-10 seeds imbedded in mucilage.

A small tree armed with long straight thorns or unarmed, probably found in Travancore, though I have not seen it. Occurs also in Malabar, South India and Ceylon.

Flowers in April. Fruits in October.

Gamble says that the wood is yellowish-white, moderately hard and close-grained, and is used for furniture and cabinet work, and he gives

W. = 48 lbs.

9. CITRUS. Linn.

Evergreen trees usually armed with axillary spines. Leaves alternate, simple. Flowers regular, bisexual or unisexual. Calyx cup-shaped. Petals imbricate. Stamens 20-60, with flat filaments. Ovary many-celled with 4 8 ovules in each cell. Fruit globose, succulent, 9 15 celled, with few seeds in each.

Under this Genus there occur a large number of forms or varieties, wild and cultivated, the classification of which has puzzled many botanists. Some consider that there are as many as 8 different species, and some, among whom may be mentioned Dr. Lindley, reduce them all to two, (1) *C. medica* including all the forms indigeno s in India or taking their origin therefrom, and (2) *C. decumana* all those coming from Polynesia.

In his Forest Flora Dr. Brandis has discussed the whole subject, grouping all the forms under three species, *C. medica*, *C. Aurantium*, and *C. decumana*, and the Flora of British India follows the same classification. To these species the following key is given.

Young shoots and leaves perfectly glabrous: transverse vesicles of pulp concrete.

Young shoots purple: petals generally tinged with red: flowers often unisexual: stamens 20-40: fruit globose, often terminated by a knob, ovoid or oblong . 1. *C. medica*.

Young shoots whitish; petals white: flowers bisexual; stamens 20-30; fruit globose or flattened: pulp sweet, acid or bitter . 2. C. *Aurantium*.

Young shoots and under side of leaves pubescent transverse vesicles of pulp distinct . 3. *C. decumana*.

C. medica includes the Citron, the Lemon, and the Sweet and Acid Lime.

C. Aurantium includes the Sweet and Bitter Orange and the Bergamot.

C. decumana includes the Shaddock and the Pomelo.

The citron, lemon and orange are now cultivated in all tropical and in most of the warmer temperate climates of the world. According to the Treasury of Botany the citron was carried to Rome in the beginning of the Christian Era, but, the first attempt at its cultivation in Italy proving unsuccessful, it was not established there till the 3rd or 4th century. The lemon was unknown in Italy till the 1[illegible]th, and the bitter orange till the 11th century. The Crusaders seem to have brought both fruits there from Palestine, where they had been introduced by the Arabs some time previously. The sweet orange was a still later introduction into Europe, and it is uncertain whether it was brought westward by the Arabs, or whether we are indebted for it to the Portuguese, "who found the fruit in abundance when they arrived in India at the end of the 15th century." Brandis).

C. medica. Linn. Fl. Br. Ind. i. 514. Bedd. Fl. Syl. xlvii. 113
(under *C. Aurantium*) Brandis For. Fl. 51. Gamble Man. Tim. 130. Eng. *The Wild Lemon*. Mal. *Kitta náranga*.

Leaves glabrous, 3-6 in. by 1-2 in., ovate, lanceolate. Petiole often winged. Flowers white, tinged with red, ½ in. across, often unisexual. Stamens 20-40. Fruits ovoid or globose, turning yellow when ripe, often with a knob.

A small tree found by me in the forests of North Travancore at an elevation of 3000-4000 ft. Height 20 ft. Diam. 6 in. Occurs also at the foot of the Himalayas, in Sikhim, Chittagong and the Western Ghats. Cultivated everywhere.

Flowers in April-May. Fruits December-March.

Bark thin, greenish-white and smooth. Wood yellowish-white, moderately hard, close grained and smooth. Rays fine and numerous. Gamble gives

W. = 52 lbs.

The wood is used for walking sticks, but it is difficult to obtain straight shoots, most of the branches and young trees being crooked.

10. FERONIA. Corr.

A small tree with straight, axillary spines, and alternate, odd-pinnate leaves. Flowers polygamous, in axillary panicles. Sepals and petals, 5, the latter imbricate. Stamens 10-12, distinct. Ovary on a short disk, 5 celled, with numerous ovules in each cell. Fruit globose, indehiscent, 1 celled, with many seeds embedded in pulp.

114 **F. elephantum** Corr. Fl. Br. Ind. i. 516. Bedd. Fl. Syl. t. 121. Brandis For. Fl. 56. Trimen Fl. Cey. i. 228. Gamble Man. Tim. 231. Eng. *The Wood-apple.* Tam. and Mal. *Vilá* : *viláththi.*

Leaves of 5-7 obovate, glabrous, sessile leaflets, minutely crenate at the tip, each $\frac{1}{2}$-$1\frac{1}{2}$ in. by about $\frac{1}{2}$ in. Spines $\frac{1}{3}$ in. Flowers $\frac{1}{2}$ in. across, green stained with red, in small, sessile cymes from the axils of fallen leaves. Fruit $2\frac{1}{2}$ in. diam., whitish brown, woody, hard and rough, containing an edible pulp.

A medium sized deciduous tree of handsome appearance, found in groves and cultivated in the plains of Travancore especially in the South, perhaps not indigenous. Height 30 ft. Diam. 1 ft. Common in the drier parts of Ceylon and through Central India.

Flowers February-March. Fruits October.

Gamble says that the wood is yellowish-white and hard, and gives as an average

W. = 52 lbs. P. = 634.

The bark is dark-grey or black, and deeply cracked longitudinally.

Brandis says that it is used for house-building and agricultural implements. The leaves smell of aniseed. The fruit is astringent, and is a useful remedy for sore throat. It is sold in most bazaars. The tree affords a good gum.

11. ÆGLE, Corr.

A spinous tree with alternate trifoliolate leaves (rarely with 5 leaflets). Flowers regular, bisexual, in axillary panicles. Calyx 4-5 lobed. Petals 4-5 imbricate. Stamens 30-60. Ovary on a cylindrical disk, 10-20 celled, with numerous ovules. Fruit globose, with a hard woody rind, filled with aromatic pulp. Seeds many, oblong, flat.

115 **Æ. Marmelos.** Corr. Fl. Br. Indi. i. 516. Bedd. Fl. Syl. t. 161. Brandis For. Fl. 57. Gamble Man. Tim. 131. Eng. *The Bael tree.* Tam. *Vilva.* Mal. *Kóovalam.*

Leaflets glabrous, ovate-lanceolate, crenate, about 1 in. long. Flowers $1\frac{1}{4}$ in. across, greenish-white, sweet-scented. Fruit 2-5 in. diam., with a smooth, grey or yellow rind, and a thick, sweet, orange, coloured pulp.

A small tree armed with straight 1-inch thorns, not indigenous but run wild, and found in groves and cultivated throughout the plains of Travancore. Height 30 ft. Diam. 1 ft. Wild in North and Central India, and cultivated throughout India and Ceylon.

Flowers in May, along with the new leaves. Fruit ripens in October-November.

The bark is white, rough and flakes off. The wood is white when fresh cut, turning grey with exposure. It is straight-grained, but soft and per shable; with a short fibre. No heart. Pores few. medium-sized and often divided. Rays very fine and numerous, Annual rings not seen.

W = 35 lbs. P. = 523.

The wood is bad : a black semi-transparent resin flows from the tree, which is the dammer of commerce. In order to increase the flow, the Hill-men are in the habit of lighting fires at the foot of the tree, a practice which frequently kills it, and, in any case, retards the growth considerably. The dammer collected by the Hill-men is delivered to the Forest Dept- and is sent to Alleppey for sale. where it fetches about 3 Rs. per thulam of 20 lbs. The annual sales amount to only a few thulams.

Regarding the dammer, Beddome quoting Broughton, says "It is" "used in this country for many small purposes, as in the manufac-" "ture of bottling-wax, varnishes &c. Its colour, when in solution," "is pale compared with its dark tint when in mass. Though in" "soluble in spirit, its solution in turpentine forms a tolerable varn-" "ish When submitted to destructive distillation it yields about" "78 per cent of oil, resembling that obtained from common colo-" " phoney."

3. FILICIUM. Thw.

Trees with pinnate, exstipulate leaves and unisexual flowers in panicles. Sepals and petals 5. Stamens 5. Ovary 2-celled, with I ovule in each cell. Drupe fleshy, ovoid, 1-seeded.

F. decipiens. Thw. Fl. Br Ind i 539. Bedd. Fl. Syl t. 129 123
Trimen Fl Cey. i. 240. Gamble Man. Tim. 142. Tam. *Ningal.* Mal. *Vál muriccha* : *niroli.*

Leaves 6-10 in. long, with 5-8 pair of leaflets, sessile, glabrous trap-shaped, acute and unequal at base; each 3 in. by ½ in. ; rachis prominently winged. Flowers ¼ in. across., pinkish-white in erect, axillary panicles, 6-8 in. long Drupe ½ in. diam., smooth, purple.

A very lofty and exceedingly handsome evergreen tree, characteristic of the drier forests where the rainfall does not exceed 80 in, found at elevation- from 1000-4000 ft. common on the Cardamom Hills to the East of the Periyar, and in South Travancore very abundant on the Eastern slopes of the Ghats in Tinnevelly above Kadayanellur. Height 90 ft. Diam. 3 ft. Found outside our limits in Ceylon and South India. Often planted in gardens.

Flowers December-February. Fruits March -April.

Bark very rough, blackish-brown. Wood red, often knotted, smooth extremely hard and close-grained with a long fibre. Pores small and numerous, often in groups. Rays extremely fine, crossed by wavy lines of darker tissue. Annual rings marked by dark bands about 10 to inch.

W. = 59 lbs. P. = 902.

An excellent wood, but little known.

Order XXII. MELIACEÆ.

Trees generally of large size, with alternate compound, exstipulate leaves. Flowers regular, bisexual or polygamous. Calyx 3-6 lobed, or with distinct sepals. Petals 3-6. Stamens 5-10, united into a tube (distinct in *Cedrela* and *Chloroxylon*) inserted outside the disk. Ovary 2-5 celled with 2 or more ovules in each. Fruit a capsule, rarely a drupe, 1-5-celled with 1 or many seeds.

A large and important Order containing 21 trees indigenous in Travancore, most of them yielding good, often fragrant, timber. To it belongs the well known "Mahogany" *Swietenia Mahagony* and *S macrophylla* immense trees of the forests of British Honduras and Central America. They have been introduced into India and have been planted in different parts of Travancore. These trees require an exceptionally free and well-drained, even sandy, soil. or they are apt to suffer from canker of the shoots. *S macrophylla* seems to thrive the better of the two. A handsome tree *Sandoricum indicum*, a native of the Moluccass, is also grown.

Ovules 1 or 2 in each cell. Seeds not winged.
- Leaflets toothed.
  - Flowers elongated. Fruit a drupe ... ... 1. *Melia.*
  - Flowers globose. Fruit a berry .. .. 2. *Cipadessa.*
- Leaflets entire.
  - Anthers included in the staminal tube.
    - Flowers bisexual .. .. 3. *Dysoxylum.*
    - Flowers polygamous.
      - Petals 5. Stamens 5 .. .. 4. *Aglaia.*
      - Petals 5. Stamens 10 .. .. 5. *Lansium.*
      - Petals 3. Stamens 6 .. .. 6. *Amoora.*
  - Anthers not included in the staminal tube.
    - Fruit 1-2 seeded, seeds arillate.
      - Leaves trifoliolate. Fruit indehiscent 7. *Walsura.*
      - Leaves odd-pinnate. Fruit caspular.. 8. *Heynea.*
    - Fruit 3-12-seeded, seeds without an aril
      - Leaves odd-pinnate. Anthers 5 .. 9. *Beddomea.*
      - Leaves equally pinnate. Anthers 8-10 ..10. *Carapa.*

Ovules many in each cell. Seeds winged.
- Stamens united into a tube.
  - Petals spreading. Tube cup shaped .. ..11. *Soymida.*
  - Petals erect Tube cylindrical .. ..12. *Chickrassia*
- Stamens distinct.
  - Petals erect. Stamens 4-6. Ovary 5-celled ..13. *Cedrela.*
  - Petals spreading. Stamens 10 Ovary 3-celled 14. *Chloroxylon*

1. MELIA. Linn.

Trees with pinnate or bipinnate leaves, and bisexual flowers in axillary panicles Calyx 5-cleft, imbricate. Petals 5. imbricate. Staminal tube free, with 20 teeth in pairs. Anthers 10. Ovary 3-5-celled. Ovules 2 in each cell. Fruit a drupe, 1-5-seeded.

- Leaves pinnate. Ovary 3-celled .. .. 1. *M. Azadirachta.*
- Leaves bi or tripinnate. Ovary 5-celled 2. *M. dubia.*

124 1. **M. Azadirachta.*** Linn Fl. Br. Ind. i. 544. Bedd. Fl. Syl t. 13 Brandis For. Fl 67 (under *M. indica*). Trimen Fl Cey. i. 244 (under *Azadirachta indica*). Gamble Man. Tim. 143 (under M. *indica*). Eng. *The Neem or Margosa tree.* Tam. and Mal. *Véppu.*

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* In Brandis Ind. Tr. the name of this tree is given as Azadirachta indica. This genus differs from Melia by having pinnate and not bi or tri-pinnate leaves

Leaves 8-15 in long with 9-15, lanceolate, acuminate, deeply ser-rate, glabrous leaflets, each 1-3 in. by ½-1½ in. Flowers white, honey-scented, ⅓ in long. Drupe ovoid, ⅔ in. long, smooth, pale yellow turning to dark purple, with one seed.*

A medium sized tree, commonly planted along road-sides in the drier parts of the low country, as Shencottah and Nagercoil, and naturalised, but not indigenous in Travancore. It does not thrive in a wet climate. Height 40 ft. Diam. 1½ ft. Wild in Ceylon, Burma and possibly in the Carnatic, and cultivated everywhere.

Flowers March-May. Fruits July-August.

Gamble says that the " bark is grey, and the wood hard and " "close-grained : sapwood grey, heartwood red. Annual rings " "doubtful. Pores scanty, moderate sized or large. Rays fine, nu- " "merous, white and prominent. The wood is scented and much " "resembles mahogany." And he gives

W. = 50 lbs. P. = 579.

The wood is durable, and being bitter, is proof against white ants. It is not much used in Travancore on account of the small size of the tree, but elsewhere it is said to be employed for furniture, agricultural implements &c. The bark is bitter. A clear gum flows from wounds in the stem which is made into a drink.

The Neem tree is highly valued throughout India, and in some places is worshipped. The bark, leaves, dried flowers and fruit are used medicinally. The oil is pale yellow and bitter, has a powerful garlic-like odour, and contains a marked amount of sulphur. It is prescribed for leprosy and rheumatism, and as a vermifuge and a remedy for mange in dogs, and is employed in the manufacture of soap. Margosa cake is used as a manure. (Pharm. Ind. ii 322.) Many persons consider that the mere presence of these trees round a house will ward off fever, and an eminent authority has stated, on good evidence, that in those villages where the Neem tree is abundant cholera never appears, though it may be very common in the neighbourhood.

2. M. **Composita**. Willd. Fl. Br. Ind. i. 545. Bedd. Fl. Syl. t 12 (under *M. composita*). Brandis For Fl. 69 (*M. composita*). Trimen Fl Cey. i. 248 Gamble Man. Tim. 45 (*M. composita*). Tam. and Mal. *Mala vémbu.* 125

Leaves 1-3 ft. long, bi-or tripinnate with 3-7 pair of pinnæ, and 3-11 leaflets on each pinna. Each leaflet oval, acuminate, crenate (or sometimes entire) glabrous. 1- in. by ½-1½ in. Flowers greenish-white, fragrant, ¼ in. long, covered with meal. Drupe smooth, ovoid, greenish-yellow 1-1½ in.

A large, deciduous tree with wide-spreading branches; common at elevations about 1000 ft., at Ariyankavu and elsewhere in our forests. Height 60 ft. Diam. 2 ft. Occurs also in Ceylon, Malabar Burmah, Australia and Africa. Often cultivated.

Flowers from January-March appearing with the young leaves. Fruits October-January.

*The fruit does not turn purple till it is rotten.

Bark dark-grown, deeply cracked. Wood soft and open-grained, coarse and elastic sapwood grey, heartwood pale-red. Pores even and medium-sized to large, fewer in the autumn-wood, more numerous in the spring-wood. Rays very fine, giving a silvery grain to the wood. Annual rings 3 or 4 to the inch.

W. = 26 lbs. P. = 391.

The tree grows very rapidly, and the timber, though coarse, is suitable for tea-boxes and rough cases. It is largely used in Ceylon for the floats of native outrigger boats, and for furniture, but it is bored by beetles and eaten by white ants. The pulp of the fruit is bitter and it is a favourite remedy amongst the labouring classes for colic. The fruits are sold in the bazaar. (Pharm. Ind. ii. 332). It is a handsome tree for avenues and grows fast but it is not long-lived.

2. **CIPADESSA.** Blume.

Small trees with odd-pinnate leaves and bisexual flowers in axillary panicles. Calyx 5-toothed. Petals 5, valvate. Stamens 10, cohering only at the base. Ovary 5-celled, with 2 ovules in each cell. Fruit a berry.

126 **C. fruticosa.** Bl. Fl. Br. Ind. i. 545. Bedd. Fl. Syl. liv. (under *Mallea Rothii*). Trimen Fl. Cey. i. 245. Gamble Man. Tim. 146. Tam. *Pulippan cheddi.*

Leaves 4-10 in. long of 4-7 oval, acute, serrate, pubescent leaflets, 1-3½ in. by ½-1½ in. Flowers globose in panicles 3-4 in long, each flower ⅙ in. across, white. Fruit red and juicy, globose, ¼ in. diam. with angular seeds.

Usually a branched shrub, but sometimes a small tree, 20 ft high and 6 in diam.; very common as undergrowth in evergreen forests, and occurring at all elevations up to 5000 ft. Found also in Malabar, Ceylon and Java.

Flowers January—February. Fruits February—March.

Gamble says that the wood is red and moderately hard, with a faint odour, and that the annual rings are marked by a white line, and gives

W = 50 lbs.

The wood is too small to be of any use except for fuel.

3. **DYSOXYLUM.** Blume.

Large trees with odd-pinnate leaves and entire leaflets. Flowers bisexual, in axillary panicles. Calyx truncate, 4-lobed. Petals 4, valvate. Staminal tube 8-lobed with 8 anthers included. Ovary 2-4 celled. Fruit a leathery capsule 1-4-seeded.

Flowers in panicles . . . 1. *D. malabaricum.*
Flowers in raceme, or spikes.
  Ovary 2-celled. Fruit yellow, rough . 2. *D. Beddomei.*
  Ovary 4-celled. Fruit purple, smooth . 3. *D. purpureum.*

127 1. **D. malabaricum.** Bedd. Fl. Br. Ind. i. 548. Bedd. Fl. Syl. liv. (under *Dysoxylum sp.*) Gamble Man. Tim. 148. Eng. *White cedar.* Mal. *Vella agil.*

Leaves about 18 in. long, of 7-11 pale green, glabrous, lanceolate leaflets, each 5-9 in. by 1½-2 in., venation very marked beneath. Petiolule ¼ in. Flowers numerous in axillary panicles about 6 in.

Gamble says that the wood is yellowish-white, hard, with a strong aromatic scent, when first cut ; no heart wood and he gives as an average.

W.=56 lbs.

"The tree is not often cut, as it is chiefly valued for its fruit. The wood is used in construction, for the pestles of oil and sugar-mills, and for agricultural implements" (Gamble,) as it is strong and tough,

This tree yields the well known Bael fruit which is such a valuable remedy for diarrhœa and dysentery, whether in its raw state or medicinally prepared, "The best preparation of Bael fruit is a" "marmelade made from the full grown, but still tender, fruit cut" "in thin slices. It keeps well." (Pharm. Ind. i. 279).

The root and leaves are used medicinally and the rind of the fruit is employed for dyeing and tanning Dict. Econ. Prod.)

Order XIX. SIMARUBEÆ

Trees with alternate, pinnate or simple leaves. Flowers regular, bisexual or polygamous. Sepals 4 or 5, more or less connate. Petals 4 or 5, valvate or imbricate. Stamens 8-10, distinct. Disk simple or lobed. Ovary 2 5-lobed, or of distinct carpels, with solitary ovules. Fruit of 1-5 distinct, one seeded carpels.

A small Order containing only 2 trees found in Travancore, neither of them yielding good timber. Most of the species have bitter bark and wood, among them *Quassia amara* and *Picræna excelsa* of the West Indies, which yield the medicinal Quassia of commerce, and *Guiacum officinale*, the Lignum-vitœ tree, sometimes cultivated in gardens in South India.

Leaves pinnate. Flowers small, polygamous . 1. *Ailanthus.*
Leaves simple. Flowers large, bisexual . 2. *Samadera.*

1. AILANTHUS. Desf.

Large trees with pinnate leaves. Flowers polygamous, in large axilliary panicles Calyx 5-fid. Petals 5, valvate. Disk 10-lobed. Stamens 10 (fewer in bisexual flowers) without basal scales Ovary 2-5 celled. Fruit of 1-5 thin, winged samaræ.

116 A. **malabarica** DC. Fl. Br. Ind. i. 518. Bedd. Fl. Syl. t. 122 Brandis For. Fl. 58. Trimen Fl. Cey. i. 230. Gamble Man. Tim. 133. Tam. *Peru.* Mal. *Pongilyam: matti pál.*

Leaves 1-2 ft long, of 10-24 unequal, entire, acute leaflets, 3-6 in. by 1-1½ in., glabrous above, glaucous beneath. Flowers yellow, ⅓ in. across. Panicles 1 ft long. Samara flat, reddish-brown with rounded ends, 2½ in. by ¾ in.

A lofty deciduous tree not uncommon in our evergreen forests at low elevations through Travancore, especially in the North. Often planted. Height 80 ft. Diam 2 ft. Occurs also in Malabar and Ceylon.

Flowers in February-March. Fruits in April-May

Bark grey, smooth and thick

Gamble says that the wood is white, soft and very spongy, and he gives

W = 23 lbs.

The bark is bitter and is sometimes used as a febrifuge. The resin is dark-brown, hard and translucent, has an agreeable smell, and is used for dysentery. When burnt it gives out a fragrance. (Pharm Ind. i. 293).

2. SAMADERA. Gærtn.

Small trees with simple leaves, and large, bisexual flowers in stalked umbels. Calyx 4-fid. Petals 4, imbricate. Stamens 8, very long, with a scale at the base. Ovary stipitate, deeply 4-lobed, 4-celled. Fruit of 1-4 hard, indehiscent carpels.

117 **S. indica.** Gœrtn. Fl. Br. Ind. i. 519. Bedd. Fl. Syl. xlix. Trimen Fl. Cey. i. 231. Gamble Man. Tim. 133. Mal. *Karingotta.*

Leaves pale when young, very dark-green and glabrous when old, entire, oblong, 6-10 in. by 2-2½ in. Petiole ½ in. Flowers pinkish-yellow 10-30 together in umbels, suspended by thin peduncles often 5 in. long, each flower 1-1½ in. across. Fruit-carpels, red, hard, semi-circular, compressed, 1-2 in. long, and containing one large seed.

A small tree occurring in the evergreen forests of the low country, and much planted for hedges, especially in North Travancore. It thrives very well, on the sandy soil by the backwaters. Height 30 ft. Diam 8 in. Occurs also in Malabar and Ceylon.

Flowers in February-March. Fruits in May-June. Gamble says that the wood is light-yellow and soft, and that there is no heart-wood. The bark (Niepa bark) and seeds are bitter. The wood also is bitter. The former is used as a febrifuge, while from the latter an oil is extracted which is bitter. The former is said to be good for rheumatism. (Pharm Ind. i. 294).

ORDER XX. OCHNACEÆ.

Small trees with alternate, simple, exstipulate leaves. Flowers regular, bisexual. Sepals 5, distinct, imbricate, persistent. Petals 5, imbricate. Stamens numerous or 10, distinct. Ovary of 3-10 distinct carpels on a swollen gynophore, with one erect ovule in each. Fruit carpels distinct, 1-seeded.

A small Order of no importance, containing only 3 trees wild in Travancore, all of small size.

Stamens indefinite : anthers opening longitudinally. . . . 1. *Ochna.*
Stamens 10 : anthers opening by terminal pores. . . . 2. *Gomphia.*

1. OCHNA. L.

Small trees with flowers in panicles, or 2-3 together, from the ends of short woody branches. Stamens indefinite. Sepals coloured. Carpels 1-celled, 1-seeded, fleshy.

Flowers over 1 1/2 in across, in short panicles. Filaments short, . . . 1. *O. squarrosa.*
Flowers less than 1 in. across, solitary or 2-3. Filaments long. . . . 2. *O. Wightiana.*

1. **O. squarrosa** L. Fl. Br. Ind. i. 523. Bedd. Fl. Syl. 1. Brandis For. Fl. 60. Trimen Fl. Cey. i. 233. Gamble Man. Tim. 136. **118**

Leaves lanceolate, finely crenate, acute at both ends, glabrous, 2-7 in. by $\frac{3}{4}$-2 in. Petiole $\frac{1}{4}$ in. Flowers yellow, $1\frac{1}{2}$—$2\frac{1}{2}$ in. across in short panicles. Fruit-carpels $\frac{1}{2}$ in. ovoid, shining black, surrounded by the enlarged sepals.

A small tree of the drier forests, not seen by me, but probably to be found in South Travancore. Occurs also in Burmah and many parts of India and Ceylon.

Flowers February-March. Fruits May-June.

Gamble says that "the wood is worthy of attention for inlaying" "and carving, but requires careful seasoning, as it works badly. It" "is used for walking sticks."

W. = 50 lbs.

2. **O. Wightiana** Wall. Fl. Br. Ind. i. 524. Bedd. Fl. Syl. li. Trimen Fl. Cey. i. 233. Gamble Man. Tim. 135. Tam. *Silimbi.* **119**

Leaves rounded or acute at base, finely crenate, acute, glabrous, dark-green above, pale beneath, lanceolate, $1\frac{1}{2}$-3 in. by $\frac{1}{2}$-$\frac{3}{4}$ in. Petiole $\frac{1}{8}$ in. Flowers yellow, $\frac{1}{2}$ in. across, few. Fruit-carpels smooth, black, $\frac{1}{2}$ in. long.

A small or medium-sized tree up to 40 ft. high and 9 in. diam. occurring in evergreen forests at low elevations near Mekkarai on the Eastern slopes. Found also in Ceylon.

Flowers in July. Fruits in October.

The wood is pale yellow, light and elastic, and makes good walking sticks.

2. GOMPHIA. Schreb.

Small trees with flowers in large, terminal panicles. Stamens 10. Carpels 5-6.

G. angustifolia Vahl. Fl. Br. Ind. i. 525. Bedd. Fl. Syl. li. Trimen Fl. Cey. i. 235. Gamble Man. Tim. 137. **120**

Leaves acute at both ends, serrate, glabrous, lanceolate, $2\frac{1}{2}$-6 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. Flowers numerous, reddish-yellow, $\frac{1}{2}$ in. across. Carpels $\frac{1}{3}$ in., black shining; seed green.

A small tree common in evergreen forests from sea level to 3000 ft. Height 30 ft. Diam. 8 in. Occurs also in Malabar, Ceylon and the Philippines.

The roots and leaves are bitter and are used medicinally (Dict. Econ. Prod.)

Flowers January-April. Fruits May-July.

Gamble says that the wood is "reddish-brown, hard, close and even-grained, and cuts easily."

ORDER XXI. BURSERACEÆ.

Trees with alternate, compound leaves. Flowers small, regular, unisexual, or polygamous. Sepals and petals 3-5. Stamens 5-10, inserted outside or on the annular, fleshy disk. Ovary free, 2-3 celled with 2 (rarely 1) ovules in each. Fruit a drupe, 1-seeded.

An Order of some importance though it only contains 3 trees wild in our forests, the best known of which is the Black Dammer. Many of the species of this Order found in other countries supply a resinous balsam, such as *Balsamodendron Myrrha*, which yields "myrrh", *B opobalsamum*, the source of "Balm of Gilead" and *Boswellia serrata*, of "Olibanum."

Stamens 8 or 10. Flowers in cymes.	1. *Protium*.
Stamens 6. Flowers in panicles.	2. *Canarium*.
Stamens 5. Flowers in panicles.	3. *Filicium*.

Some Botanists place ***Filicium*** under ***Sapindaceæ***.

1. PROTIUM. W. and A.

Small trees often spinous. Leaves with 3-9 leaflets. Flowers polygamous, in dichotomous cymes. Sepals and petals generally 4. Stamens 8, rarely 10. Ovary 2-celled with 2 ovules in each. Drupe 2-valved.

121 **P. caudatum**. March Fl. Br. Ind. i. 530. Bedd Fl. Syl. t. 125 Trimen Fl Cey. i. 236 (under *Balsamodendron caudatum*). Gamble Man Tim. 139.

Leaflets ovate, unequal at base, with a long acumination, entire $1\frac{1}{2}$-3 in long, glabrous Flowers in 3-8 in. cymes, pinkish-red. Drupe globose, the size of a pea

I have only found this small tree once, on the Cardomom Hills. It seems to be confined to the drier hill regions. It occurs also in Ceylon and parts of S India.

Flowers in July.

Trimen says that the "whole plant is strongly resinous and has" "an agreeable scent." Gamble states that the "sapwood is white," "and the heartwood grey with darker streaks." and he gives

W. = 33 lbs.

2. CANARIUM. L.

Large trees with odd-pinnate leaves and polygamous flowers. Sepals 3, valvate Petals 3 or 4 Stamens 6. Filaments connate into a tube. Ovary, 3-celled with 2 ovules in each. Drupe ellipsoid, trigonous, with 1-3 seeds.

122 **C. strictum** Roxb. Fl. Br. Ind. i 534. Bedd. Fl. Syl. t. 128. Gamble Man. Tim 141 Eng *The Black dammer*. Tam. *Karang kunthrikkam*. Mal *Kuntharikka payin: thelli*.

Leaves 1-4 ft long, of 7-15 lanceolate, acuminate, serrate leaflets, at first rusty-tomentose, at length glabrous above rusty beneath, each 3-12 in by 1-6 in Panicles erect, axillary, up to 1 ft long. Flowers bright-yellow. $\frac{1}{4}$ in. across and $\frac{1}{3}$-$\frac{1}{2}$ long. Drupe blue, 1-2 in. long.

A very lofty deciduous tree with an exceedingly straight, white, cylindrical stem. Its leaves are bright-yellow when young but turn, first red and then green It is common in all our evergreen forests from sea level to 5000 ft. It attains a height of 100 ft. with a diameter of 3 ft. Outside our limits it is found in Malabar and South India, but not in Ceylon.

Flowers January-March. Fruits November-January.

long, very fragrant, greenish-yellow, ¼ in across. Capsule pear-shaped, roughly tubercled and yellow. 2-3 in long, containing 3 or 4 large reddish brown seeds.

An immense tree, common in all our evergreen forests through Travancore from 0-3000 ft., especially at about 1500 ft Height 120 ft. Diam 5 ft Found also in Malabar and Coorg.

Flowers in March—April. Fruits June—July.

The bark is grey and covered with white warts. The wood is yellowish or light-orange, hard, close-grained and elastic. Pores of medium size, numerous and evenly distributed. Rays fine and close together. No sapwood, the timber being even throughout. Annual rings from 4 to 20 to the inch, marked by dark lines These concentric rings, the silvery appearance of the wood and its sweet scent, are the chief features for identification The timber is remarkably even, both as regards its weight and its transverse strength. The average of a large number of experiments shows

W. = 48 lbs. P. = 992.

White cedar is, in fact, one of the strongest timbers we have, for out of the 2.0 and odd timbers which I have tested, only the Ebony-*Cassia fistula* and one or two other less-known woods averaged higher.

The white cedar grows fairly fast, at all events when it is young. A tree planted at Malayattur attained a height of 27½ ft, and a girth of 12 in, at 4½ ft. from the ground. in 7 years At 10 years its girth was 15 in This wood give about 4 rings to the inch of radius, but the growth of older trees is very much slower A tree of 2 ft. diam. would not be less than 150 years old, and a veteran of 5 ft diameter, which one occasionally sees in the interior forests of North Travancore, must be upwards of 4' 0 years old. The seed is large and heavy and does not lend itself to wide distribution, while the number of seeds produced by each tree is limited. I fear, therefore, that its reproduction in our forests is not satisfactory. The tree is found both at low elevations and up to 2000 ft. and more. It has a tendency to be gregarious and is frequently found in company with the anjili, with an undergrowth of cardamoms, the same soil and elevation being suitable to all three.

White cedar is used for the manufacture of oil-casks in Cochin and to a limited extent for furniture and house-building For the last named purposes it is less adapted, on account of its tendency to warp and contract, even after long seasoning, but for oil-casks nothing could be better where strength, evenness of quality, and moderate weight are required, and so long as it is kept moist, the wood does not alter in shape.

About 21,000 candies (say 300.000 cub. ft) are annually imported into Cochin, the greater part of which comes from Calicut, Travancore supplying about one-third of the quantity. From 1-1½ candies of timber are required for each ton of oil. There is a steady demand for this wood, as the production of oil is increasing, and after the great Cochin fire in 1889, when so many casks and so much oil were destroyed, old casks were reimported from England, as the supply of white cedar available was insufficient.

The price of white cedar was Rs. 8-9 per candy in 1890. It is now from 15-18 Rs. with an upward tendency.

128 2. **D. Beddomei.** Hiern. Fl. Br. Br. Ind. i. 548. Gamble Man. Tim. 146. Tam. *Adanthei.*

Leaves 12-15 in. long, of 7-9 alternate, or opposite glabrous, lanceolate, acuminate leaflets, each 4-6 in. by 1½-2 in. Petiolule ½ in. Flowers in short axillary spikes 3-6 in. long, each ⅓ in across, greenish-yellow. Ovary 2-celled. Fruit a yellow ribbed capsule.

A large tree found in the evergreen forests of Peermade and the Cardamom Hills, not uncommon at an elevation of 3400 ft. Height 70 ft. Diam. 2½ ft. Endemic.

Flowers in November. Fruits in November—December.

Very little is known about this tree, and though I found it abundant on the Peermade plateau some years ago I have not met with it since.

The timber is said to be sweet-scented, but it does not appear to be used.

129 3. **D. purpureum.** Bourdillon. Journal Bom. Nat. Hist. Soc xii. 349. Gamble Man. Tim. 148. Mal. *Kár agil; puvil agil.*

Leaves 12-15 in long, of 7-11 alternate, or opposite lanceolate, or ovate dark-green, acuminate, glabrous leaflets, each 5-8 in. by 1½-3 in Petiolule ¼ in Flowers greenish-yellow, ⅓ in. across in short spikes 6 in long, Capsule globose, smooth, dark purple, 2-3 in. diam containing 3-4 large green seeds.

A large tree, local, but not uncommon, in the evergreen forests of the Kóni and Róni valleys, at elevations between 1000-2000 ft. The tree has a strong resemblance to *D. malabaricum*, but the bark is smoother, and the leaves are broader and softer than in that tree. Height 100 ft. Diam. 3 ft Endemic.

Flowers March—April. Fruits October—November.

Bark pale, smooth. Wood reddish-brown, smooth, close-grained, hard with a fibre of medium length. Pores small to moderate-sized, few, single or in groups of 2 or 3. Rays fine, crossed by wavy bands of white tissue. Annual rings marked by dark lines, not conspicuous about 6 to inch.

W. = 52 lbs. P. = 708.

The wood has but a faint scent. No use is made of the tree, though the timber promises to be excellent.

4. AGLAIA. Lour.

Trees with glabrous, odd-pinnate leaves. Flowers small, globose polygamo-diœcious. Calyx deeply 5-lobed, imbricate. Petals 5, imbricate, Staminal tube globose Anthers 5, included. Ovary 1-3 celled. Fruit fleshy or dry, with 1 or 2 seeds in each.

Leaves glabrous beneath Fruit succulent.
  Leaflets 5, rarely 7. . . . 1. *A. Roxburghiana.*
  Leaflets 9-11 . . . . 2. *A. Maiæ.*
Leaves beneath rusty-pubescent. Fruit dry.
  Leaves less than 1 ft.: leaflets erect,
    stalked. 3. *A. travancorica*

Leaves exceeding 1 ft. : leaflets drooping, sessile . 4. *A. minutiflora.*

1. **A odoratissima.** Blume. Fl. Br. Ind. i. 555. Bedd. Fl. Syl. t. 130. Trimen Fl. Cey. i. 246. Gamble Man. Tim. 149. Tam. *Chokkala.* Mal. *Punyava.* 130

Leaves 3-7 in long, of 5 (rarely 7) leaflets, glabrous on both sides, pale beneath, lanceolate, narrowed to the base, $1\frac{1}{2}$-4 in. by $\frac{1}{2}$-$1\frac{1}{2}$ in. Flowers yellow, $\frac{1}{2}$ in. across in axillary panicles Fruit globose, $\frac{3}{4}$ in. diam., buff, succulent, enclosing 1 or 2 seeds.

A large, handsome, evergreen tree, common throughout Travancore from sea level up to 3000 ft. Height 80 ft. Diam. $2\frac{1}{2}$ ft. Occurs also in Malabar, Ceylon and Malaya.

Flowers November—December. Fruits July—August.

Bark greenish-brown blotched with yellow, smooth, very thin. Sapwood pale, heartwood dark-red, smooth and very strong, close-grained and very hard, with a long fibre Pores medium-sized and small. Rays very fine and numerous, crossed by wavy concentric lines of white tissue. Annual rings indistinct.

W.=57 lbs. P.=896.

The growth is fast, 4-5 rings to the inch. The timber is much valued for the spokes of wheels and for axe-handles. and the tree is well worth attention. The fruits are described as sweet, astringent, and tonic and used medicinally." (Dict Econ. Prod.)

2. **A. Maiæ** Bourdillon in Journal Bomb. Nat. Hist. Soc. xii. 350. Gamble Man. Tim. 150. Tam *kiragil.* 131

Leaves $1\frac{1}{2}$-2 ft. long, of 9-11 leaflets, very glossy, pale when young, dark-green when mature, glabrous beneath, lanceolate, unequal, each leaflet 4-9 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in., or $\frac{1}{2}$ in. petiolules. Flowers in lax panicles about 1 foot long, each flower 1/10 in. across, yellow. Fruit ovoid, about 1 in. long, pubescent, buff.

A handsome, evergreen tree of medium size found at elevations between sea level and 1200 ft, at Ariyankavu, Malayattur and elsewhere in the moist forest. Height 60 ft. Diam. 1 ft. Endemic.

Flowers May—June. Fruits August—September.

Bark mottled brown and white and flaking off, rather smooth, $\frac{1}{4}$ in. thick. Wood dark reddish-brown. hard. close and even-grained. Fibre long. Pores moderate-sized, few. Rays, fine, numerous and regular

W.=57 lbs. P.=1061.

A handsome wood and very sweet scented. Has been mistaken for sandalwood. The timber is little known and is never used. It is well worth growing.

3. **A. travancorica.** Hiern. Fl. Br. Ind. i. 557. 132

Leaves without glands, 9 10 in. long, with 7-9 leaflets, dark-green above, very rusty beneath, coriaceous, lanceolate, entire, obtuse, erect, connivent, each 2-4 in. by $\frac{3}{4}$-1. narrowed to the base, veins 10-12 on each side of the mid rib, Petiolules $\frac{1}{3}$-$\frac{1}{2}$ in. Flowers yellow. 1/12 in. across. in axillary, rusty, compound panicles. Fruit dry. pyriform. 1 in. long, covered with rusty tomentum.

A handsome tree of medium size, found only in South Travancore at the higher elevations (above 3000 ft.) in the evergreen forests at Chimunji, Mutthukuli vayal &c., locally abundant and gregarious, Height 50 ft. Diam. 1 ft. Endemic.

Flowers in November and April. Fruits in May and December.

This tree has been confused with the next, specimens sent to Kew having been named *A. minutiflora*, but they are quite different trees. The chief points of difference are (1) the erect character of the leaves, the absence of any gland on the rachis, the smaller size and fewer number of veins, and the presence of petiolules (2) the shorter and more compact inflorescence and larger flowers, and (3) the pyriform, not globose, shape of the fruit. The trees are sometimes found growing together and when thus seen no one could possibly confuse them.

The wood is fragrant and pink, but it has not been used.

133 4. **A. minutiflora**, Bedd. Fl. Br. Ind. i. 557. Bedd. Fl. Syl. ccxxxvii. Gamble Man. Tim. 149. Mal. *Nir Mulei.*

Leaves often with a large gland on the rachis. 15-24 in. long, of 9-13 leaflets, dark-green above, beneath rusty, lanceolate, with a long acumination, drooping, slightly crenate or entire, each 5-9 in. by 1-2 in., sessile, with 15-20 pairs of veins. Flowers fragrant, very minute, (1/24 in. across) in much-branched, rusty panicles, often 2 ft. long Fruit globose, dry, 1 in. diameter, covered with rusty tomentum.

A slender tree of medium size, not uncommon in the evergreen forests throughout Travancore at elevations between 1,500-3,000 ft. Height 60 ft. Diameter $1\frac{1}{2}$ ft. Probably confined to the Southern Peninsula.

Flowers in October-December. Fruits in April-May.

Bark is rough and the wood fragrant and reddish-pink. No use is made of the timber.

5. LANSIUM, Rumph.

Trees with glabrous, odd-pinnate leaves. Flowers polygamodiœcious, in axillary spikes or panicles. Sepals and petals 5, rounded, imbricate. Staminal tube globose, anthers 10 in two rows, Ovary 3-lobed, 3-celled with 2 ovules in each. Fruit succulent, seeds enclosed in pulp.

134 **L. anamalayanum**, Bedd. Fl. Br. Ind. i. 558 Bedd. Fl Syl. t. 131. Gamble Man. Tim. 150.

Leaves 6-9 in. long. of 5 very glabrous, lanceolate, acuminate leaflets, each 2-4 in. by 1-2 in.

Flowers yellowish-white, $\frac{1}{6}$ in across, in 1-2 in. spikes or panicles few together. Fruit ovoid, $\frac{3}{4}$ in. long, grey, containing 1-2 seeds. A handsome, dark-leaved tree of medium size, found in evergreen forests at elevations between 1,500 and 3,000 ft. throughout Travancore. Height 50 ft. Diameter 1 ft. Found also in Malabar.

Flowers in March-April. Fruits in July.

" Bark $\frac{1}{8}$ in. grey covered with small lenticels, wood very hard, pale yellowishwhite, smooth, straight grained and even, scented. Pores scanty, very small. Rays very fine and indistinct, crossed by numerous wavy bands,

W = 62 lbs. P = 1041.

An excellent wood but of small size and therefore not used."

6. AMOORA, Roxb.

Trees with odd-pinnate leaves. Flowers polygamo-diœcious, in axillary spikes or panicles. Calyx 4-5-toothed. Petals 3, imbricate. Staminal tube globose, anthers 6, included in the tube. Ovary 3-celled with 2 ovules in each. Fruit capsular, seeds enveloped in a fleshy aril.

Leaflets 9-17	Inflorescence spicate	1. *A. Rohituka.*
Leaflets 4-6.	Inflorescence paniculate	2. *A. canarana*

1. **A. Rohituka** W. and A. Fl. Br. Ind. i 559. Bedd. Fl. Syl. t. 132. Brandis For. Fl. 69. Trimen Fl. Cey. i. 249. Gamble Man. Tim. 150.* 135

Leaves 1-2½ ft. long, of 9-17 glabrous, lanceolate, acuminate, oblique, subsessile leaflets, each 3-4 in. by 1-1½ in. Flowers pale-yellow, sessile, globose, ¼ in. across, arranged in spikes. Capsule pyriform, red, 3 valved, 1-1½ in. long, containing 2-3 brown seeds immersed in a yellow aril.

An evergreen tree of medium size, found occasionally in moist forests at about 2,000 ft. in Travancore.† Height 40 ft. Diameter 1 ft. Widely distributed through India, Ceylon and Malaya and sometimes planted for ornament.

Flowers April-May. Fruits in February-March.

Gamble says that the bark is thin and grey, wood reddish, close and even-grained and hard, and that it is good, and he gives

W. = 41 lbs.

He also states, that an oil is expressed from the seeds in Bengal. In Travancore the tree is so rare that no use seems ever to have been made of it. The bark is pounded up and applied as a poultice for rheumatism.

2. **A. canarana**, Benth and Hook f. Fl. Br. Ind. i. 560. Gamble Man. Tim. 150. Mal. *Kár agil.* 136

Leaves 6-15 in. long, of 3-7 glabrous, lanceolate, acuminate leaflets, each 3-6 in. by 1½-2½. Petiolule ¼ in. Flowers pale-yellow, small, on short pedicels, in dense lepidote panicles. Fruit obovoid.

A large evergreen tree found in the forests of the Cardamom hills at an elevation of 3,500 ft., and also in the forest about Malayattur 200 ft. elevation. Rare. Height 70 ft. Diameter 2 ft. Found also in Canara and on the Anamallays.

Flowers in January-February. Fruits in May-June.

Nothing is known of the timber of this tree or its uses.

7. WALSURA, Roxb.

Trees with trifoliolate leaves, and bisexual flowers in panicles. Calyx 5-lobed. Petals 5, slightly imbricate. Stamens 10, filaments broad, distinct nearly to base. Ovary 2-celled with 2 ovules in each

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* The leaflets are up to 10½ pair, and each leaflet is 3-9 in. by 1-3 in. Petiolules sometimes ½ in. Fruit pink, aril scarlet."

† "This tree is to be found in Peermade at 3500 ft."

cell. Fruit indehiscent, 1-celled, pericarp thin, seeds enveloped in an aril.

137 **W. piscidia.** Roxb. Fl. Br. Ind. i. 564. Bedd. Fl. Syl. lvi. Trimen Fl. Cey. i. 250. Gamble Man. Tim. 152. Mal. *Péi illapicha.*

Leaves 2-7 in. long, each leaflet 1-3 in. by $\frac{1}{2}$-$1\frac{1}{2}$ in., obovate, narrowed to the base, glabrous, entire, pale beneath. Inflorescence about 4 in. long. Flowers greenish-yellow $\frac{1}{6}$ in. across. Fruit ovoid, $\frac{1}{2}$ in. long, covered with brown tomentum. Seed pale-brown, aril white, juicy.

A lofty tree of the evergreen forests at Kulathurpuzha and low elevations elsewhere. Height 90 ft. Diameter 2 ft. Occurs elsewhere in Malabar and Ceylon.

Flowers in November. Fruits February-April.

Bark dark, rough, very thin. Wood very hard, fine and close-grained, sapwood pale-brown, heartwood dark-brown, streaked with black. Pores very small and even. Rays very fine, crossed by broad, wavy conspicuous bands of white tissue. Annual rings marked by dark lines. 6 to inch.

W. = 59 lbs. P. = 947.

The meaning of the vernacular name is that the tree is heart-breaking on account of its hardness. No use seems to be made of the timber. Beddome says that the pulp of the fruit is sed to intoxicate fish,* and that it does not make them unwholesome.

8. HEYNEA. Roxb.

Trees with odd-pinnate leaves. Flowers bisexual, in long-peduncled, axillary panicles. Calyx 4-5 lobed. Petals, 4-5, imbricate. Staminal tube 8-10-fid, bearing 8-10 anthers between the teeth. Ovary 2-3 celled, with 2 ovules in each cell. Fruit capsular 1-celled 1-seeded, arillate.

138 **H. trijuga.** Roxb. Fl. Br. Ind. i. 565. Bedd. Fl. Syl. t 134. (under *H. affinis*) Brandis For. Fl. 70. Gamble Man. Tim. 152. Mal. *Korakkádi.*

Leaves 4-12 in. long, of 5-9, ovate, acuminate, very glossy, oblique leaflets, glaucous beneath, each leaflet 2-6 in. by 1-3 in. Inflorescence about 1 ft long. Flowers white, $\frac{1}{3}$ in. across. Capsule globose, pointed, bright red, the size of a marble, opening into two broad valves. Aril white, surrounding the yellow brown seed.

A small tree very common in evergreen forests at elevations above 2,000 ft., as Chimunji, Peermeed &c. up to 6,000 ft. Height 30 ft. Diameter 1 ft. Occurs also in North India, Burmah, Bengal and Malabar, but not in Ceylon. Often cultivated for ornament.

Flowers March-April. Fruits in December-February. Bark rough, than and warty. Gamble says that the wood is yellowish-white and moderately hard, and gives

W. = 54 lbs.

No use is made of the tree or its timber.

9. BEDDOMEA. Hook. f.

Small trees with 1-5 foliolate leaves, leaflets quite entire. Flowers bisexual, small, globose, few, in axillary racemes. Calyx 4-6-fid,

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* "The bark also is used to intoxicate fish".

imbricate. Petals 4-6, imbricate. Staminal tube short. Anthers 5-6, sessile, exserted. Ovary hairy. 3-celled with 2 ovules in each cell. Fruit a leathery capsule, containing 3-5 large, angular seeds without an aril.

B. simplicifolia. Bedd. Fl. Br. Ind. i. 566. Bedd. Fl. Syl. t. 135. Gamble Man. Tim. 153. 139

Leaves 1-foliolate, leaflets lanceolate, acuminate, glabrescent, 3-6 in. by 1-3 in. Petioles $\frac{1}{3}$-1 in. Young parts with scurfy scales. Flowers variable in size from 1/12 to nearly $\frac{1}{2}$ in. across. Fruit ovoid the size of a pigeon's egg, covered with rusty tomentum.

A tree up to 25 ft. high and 1 ft. diameter, found by Beddome on the Travancore hills between 2000-4000 ft., but not seen by me. Occurs also in the hill-forests of Canara, Coorg, Wynaad and the Anamallays.

Nothing is known of the tree or its timber.

CARAPA Aubl.

Glabrous trees with equally pinnate leaves. Flowers bisexual in lax panicles. Calyx 4-fid. Petals 4, reflexed. Staminal tube globose with 8 anthers along its edge. Ovary 5-celled, with several ovules in each cell. Fruit a very large, 1-celled, 4-valved capsule containing many seeds. No aril.

C. obovata. Blume. Fl. Br. Ind. i. 567. Bedd. Fl. Syl. t. 136. Trimen Fl. Cey. i. 251. Gamble Man. Tim. 153. Eng. *Cannon ball tree.* 140

Leaves 4-8 in. long with 2-4 opposite, entire, ovate leaflets, sessile, shining and pale green, each 2-5 in. by 1-2$\frac{1}{2}$ in. Panicles 1-5 in. Flowers few, $\frac{1}{2}$ in. across, pinkish-yellow. Fruit 4-6 in. diameter, globose, brown containing 6-12 angular pink seeds.

A moderate-sized evergreen tree found on swampy sea coasts. It probably occurs in our backwaters, though I have not observed it. Found through India, Ceylon and parts of Africa and Australia.

Flowers (in Ceylon) September-December.

Gamble says that the bark is thin and grey, the wood is red and hard, sapwood lighter. Annual rings marked by a continuous belt of pores and a dark line, and he gives

W = 47 lbs. P = 526.

The wood is used for building and furniture in Bengal and the fruit yields an oil.

11. SOYMIDA. Adr. Juss.

A glabrous tree with bitter bark and equally pinnate leaves. Flowers bisexual, in panicles. Calyx 5-fid, imbricate. Petals 5, imbricate, spreading. Staminal tube short, 10-cleft with 10 subsessile anthers along the edge. Ovary 5-celled with 10-12 ovules in each. Fruit a 5-valved capsule containing many flat seeds, winged at both ends.

S. febrifuga. Adr. Juss: Fl. Br. Ind. i. 567. Bedd. Fl. Syl. t. 8. Brandis For. Fl. 71. Gamble Man. Tim. 155. 141

Leaves 9-18 in. long, of 6-12 opposite, entire, oblique, oblong, subsessile leaflets, each 1$\frac{1}{2}$-5 in. by $\frac{3}{4}$-3 in. Flowers greenish-white, $\frac{1}{4}$ in. across. Capsule smooth, black, 1-2$\frac{1}{2}$ in. long.

A very loftydeciduous tree said to occur in Travancore, though I have not observed it. As it requires a dry climate it should be looked for in the south, and in the Anjinad Valley in the north. It attains a height of 70-80 ft and a diameter of $2\frac{1}{2}$ ft. It is found in "North-Western" and Central India, and in the southern Peninsula, but is not wild in Ceylon.

Flowers in (North-west Province) April-May. Fruits July-August.

Gamble says that the bark is $\frac{1}{3}$-$\frac{1}{2}$ in. thick, bluish grey or dark-brown, "sapwood small, whitish: heartwood extremely hard and close-grained, very dark red-brown and very durable, and that the rays give it very pretty silver-grain with a satiny lustre, and he gives

W. = 74 lbs.

The wood is esteemed and is used for construction, wellwork &c. Gamble calls it "a beautiful and interesting tree, with a valuable "wood" but says that the latter is cross-grained and difficult to plane. It makes beatiful furniture, it well seasoned. The bark is bitter, astringent and antiperiodical. It has been used for tanning and dyeing. It yields a strong fibre. "(Dict. Econ. Prod.)"

12. CHUCKRASSIA. Adr. Juss.

A lofty tree with pinnate leaves. Flowers bisexual in terminal panicles. Calyx 4-5-fid. Petals 4-5. erect oblong, slightly twisted Staminal tube cylindrical with 8-10 anthers on the edge. Ovary 3-5-celled with many ovules. Fruit a woody capsule with 4-5 valves, seeds numerous, flat, winged.

142 **C. tabularis.** Adr. Juss. Fl. Br. Ind. i. 568. Bedd. Fl. Sy, t. 9. Trimen Fl. Cey. i. 252. Gamble. Man. Tim. 156. Eng. *Chittagong wood.* Tam. *Malei veppu, Vedi vembu.*

Leaves 12-18 in. long, of 10-20 glabrous, obliquely ovate, acuminate, entire leaflets. dark-green above. pale beneath, each 2-5 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in. Flowers yellowish-white, about $\frac{3}{4}$ in. long and broad. Capsule ovoid, pointed. smooth, dark-brown, $1\frac{1}{2}$-2 in. long.

A very large tree, bare of leaf in the cold weather, thinly distributed through our evergreen forests at elevations from 1000-2000 ft. This tree is common at 3000 ft. near Mlaparai on the cardamom hills. Height 120 ft. Diam. 5 ft. Found also in Malabar, Ceylon and Malacca.

Flowers April-May. Fruits December-January.

Bark dark-brown and deeply cracked. Wood reddish-brown and hard with a satiny justure and works well, sapwood pale. Annual rings distinctly marked by a line, about 8 to the inch. Gamble gives as an average,

W. = 49 lbs.

In Travancore we know nothing of the wood, but in Ceylon and many parts of India it is very highly valued for furniture. Gamble says that the bark is a powerful astringent and that the flowers give a red or yellow dye. The tree is well deserving of attention, and, as it seeds very freely, there would probably not be much difficulty in obtaining a supply of seed for sowing.

13. *CEDRELA. Linn.

Large trees with pinnate leave. Flowers bisexual, in terminal panicles. Calyx 5-fid. Petals 5 erect, imbricate. Stamens 4-6 free, inserted on the disk. Ovary 5-celled with 8-12 ovules in each cell. Fruits 5-valved capsule. Seeds numerous, flat, winged.

C. Toona. Roxb. Fl. Br. Ind. i. 568. Bedd. Fl. Syl. t. 10 143
Brandis For. Fl. 72. Gamble Man. Tim. 157. Eng. *Red cedar* Tam. *Thévathágam.* Mal. *Mathagiri vémbu: vedi vémbu: mala véppu.*

Leaves 1-3 ft. long, of 20-30 lanceolate, acuminate, oblique leaflets, glossy above and pale beneath, entire or serrate, each 2-6 in. by 1-4 in. Flowers in 6-in. drooping panicles, white, honey-scented each ¼ in. long and broad. Capsule ovoid, smooth, brown, about ¾ in. long. containing numerous thin, brown seeds.

A very large tree of the evergreen forests, dropping its leaves in, September, and bare of leaves for some time. Common through Travancore at elevations from 500-4000 ft. Height 100 ft. Diam. 5 ft. Occurs elsewhere through India, Burmah, Java and Australia, but not in Ceylon, and is planted in avenues and grown in planta, tions in some localities.

Flowers from November-January, coming out with the young leaves. Fruits August-October.

Bark thin, rusty-brown and rough, scaling off in large flakes when old. Wood bright reddish-brown to red, shining, even-grained. soft and sweet-scented. Pores often divided, medium-sized and scanty in the autumn-wood, close together and large in the spring-wood, forming a ring. Rays fine and numerous, very distinct, giving a silvery grain. Annual rings very distinct, from 3-6 per inch.

My experiments with very dry wood gave W = 28 lbs. and P = 360, and with freshly cut wood, W. = 40 lbs.: P = 372. Gamble takes as an average.

W. = 35 lbs. P. = 465.

The seed is very small and light, and is widely distributed by the wind. Seedlings are to be seen springing in large numbers in abandoned land at suitable elevations. Young plants are easily raised from seed' but they do not bear transplanting The growth is rapid Gamble gives the average measurement of 50 trees in Assam at 22 years as 63 ft. high 22 in. girth which shows a growth of about 6 rings per inch. We have made no attempt to cultivate this tree but it is well-worth attention.

The wood seasons well and does not split or warp. It is fairly durable and is not eaten by white ants nor bored by beetles, the sap-wood excepted. It is highly valued for furniture and door-panels, and more especially for cigar boxes. It has also been used for tea

*In the Fl. Br. Ind. only one species *Cedrela* is given as occurring in British Ind'a, but later researches seem to indicate that there are 5 or 6 species. Gamble in his Man. Tim. pp 157-9 gives two species, *C Toona* and *C. microcarpa*, as growing in the forests of South India, the former in the plains, and the latter between 2000-4000 ft. Further enquiry is necessary to determine whether we have both species or only one.

boxes and shingles. At present there is not a great demand for this wood, but the demand is increasing and it will come more into use when teak and other more popular woods become scarce and expensive.

The present value is about 8-9 Rs. per candy or 8 annas per cubic foot in log.

"The leaves are used to feed cattle, and the flowers give a red" "or yellow dye. The bark is astringent, and gives a resinous gum:" "it is also used as a febrifuge." (Gamble.)

14. *CHLOROXYLON. DC.

A tree with equally pinnate leaves. Flowers bisexual, in terminal and axillary panicles. Calyx 5-fid, Petals 5, imbricate, spreading Stamens 10, quite distinct. Disk large, 10-lobed Ovary 3-celled with 8 ovules in each cell. Fruit a leathery capsule 3-celled and 3-valved. Seeds numerous, with a long wing at one end.

144 **C. Swietenia** DC. Fl. Br. Ind. i. 569. Bedd. Fl. Syl. t. 11 Brandis For. Fl. 74. Trimen Fl. Cey. i. 253. Gamble Man. Tim, 160.

Leaves 5-9 in long, of 20-40 glabrous, unequal, oblong, subsessile leaflets, dull bluish-green, gland-dotted beneath, each $\frac{3}{4}$ in. by $\frac{1}{3}$ in. Flowers $\frac{3}{8}$ in. long, cream-coloured. Capsule ovoid, smooth, 1 in. long, dark-brown. Seeds flat, $\frac{3}{4}$ in. long.

A very handsome, deciduous tree of moderate size, found in Travancore only in the very dry forests below the Anjinaud at an elevation of 2000 ft., rare. Bare of leaves in January-February. Height 50 ft. Diam. 2 ft. Found elsewhere in Central India, Bombay, the Deccan and Ceylon, but always where the rainfall is light.

Flowers in March-April, Fruit ripens in June.

Gamble says that the " bark is light-grey or yellow, $\frac{1}{3}$ in. thick, " " soft and spongy. Wood very hard, yellow or cream coloured, the " " inner wood darker, but without a distinct heartwood ; having a " " fine satiny lustre. Annual rings distinct. Pores very small and " " rays very short." And he gives

W. = 60 lbs. P. = 1000.

In Travancore the tree is so rare that its timber is not used at all, but elsewhere, and especially in Ceylon, it is much employed for cabinet work, furniture, bridge and house building, and for railway, sleepers, and it has been tried for wood engraving. Gamble says that " figury wood fetches a good price reaching as much as 7 Rs. " per cubic ft. in Colombo ordinary wood being valued at Rs. $2\frac{1}{2}$. " It is much exported from that island.

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*Many Botonists place *Chloroxylen* under the Order Rutaceae on account of its gland-dotted aromatic leaves, free stamens, yellow wood and corky bark See Indian Forestor. xxviii. 341 and 410: xxix 18.

Order XXIII. CHAILLETIACEÆ.

Small trees with alternate, simple leaves and persistent stipules. Flowers regular, small, polygamo-diœcious, in axillary corymbs. Sepals 5, imbricate. Petals 5, distinct, 2-lobed. Stamens 5, distinct. Disk of 5 scales. Ovary 2-celled with 2 pendulous ovules in each cell. Styles distinct. Fruit a 2-valved drupe, with a hard 2-seeded stone.

A small Order containing only one tree wild in our forests.

CHAILLETIA. DC.

Characters of the Order.

C. **geloinoides**. Hook f. Fl. Br. Ind, i. 570. Bedd. Fl. Syl lix. Trimen Fl. Cey. i. 254 (under *C. sumatrana*). Gamble Man. Tim. 162. 145

Leaves glabrous, entire or slightly toothed, oval, acute, narrowed to the base, 2-5 in. by $\frac{3}{4}$-$2\frac{1}{2}$ in. Petiole very short. Stipules setaceous. Flowers pale-green, $\frac{1}{6}$ in. across. Drupe ovoid, grey-green and pubescent, $\frac{3}{4}$ in. long. Stone pale-brown, covered by a soft. scarlet coat.

A small tree occurring in our evergreen forests at 2000 ft. or so. Height 25 ft. Diam. 6 in. Found elsewhere in Bengal, Malabar, and on the Western Coast, and in Ceylon.

Gamble says that the bark is thin, wood light yellowish-brown, moderately hard. Pores small, rather scanty. Annual rings marked by the absence of pores in the spring-wood. Rays fine to broad, giving a silver grain.

"The wood somewhat resembles that of the oaks." It is not used in Travancore.

Order XXIV. OLACINEÆ.

Trees with alternate, simple, extipulate leaves. Inflorescence cymose. Flowers regular, bisexual or polygamous. Calyx small, cup-shaped, with 4-6 teeth. Petals 4-6, free or slightly connate. Stamens 4-6, usually free. Disk annular. Ovary free or inferior, 1-5-celled, with 1-5 pendulous ovules in each. Fruit a drupe with a hard, 1-celled, 1-seeded stone.

A small Order containing about 6 forest trees, none of them of any importance.

Stamens opposite petals.
- Calyx adherent to the fruit. Ovary 5-celled . . 1. *Strombosia*.
- Calyx not adherent to the fruit. Ovary 1-celled . . 2. *Anacolosa*.

Stamens alternate with petals.
- Petals glabrous within.
  - Flowers polygamous. Petals united . . 3. *Gomphandra*.
  - Flowers bisexual. Petals free . . 4. *Apodytes*.
- Petals villous within . . . . . 5. *Mappia*.

1. STROMBOSIA. Blume.

Trees with bisexual flowers in axillary cymes. Calyx fleshy, 5-toothed. Petals 5, distinct, hairy within. Stamens 5. opposite the petals and adnate to them. Ovary inferior, 5-celled, with 5 ovules. Drupe adherent to the calyx.

146 **S. ceylanica** Gardn. Fl. Br. Ind. i. 579. Bedd. Fl. Syl. t. 137. Trimen Fl. Cey. i. 257. Gamble Man. Tim. 164.

Leaves 4-6 in by 1⅓-2 in., lanceolate, acute at both ends, entire and glabrous. Petiole ⅓ in. Flowers greenish-white, 1/12 in. across, sub-sessile. Drupe pyriform, rugose deep purple, 1 in long.

A large tree, probably to be found in the Travancore forests, though I have not observed it. Occurs on the Western coast and in Ceylon.

Flowers (in Ceylon) July—September.

Trimen says that the wood is "moderately heavy, rather soft, pale yellowish-brown and shining."

2. ANACOLOSA. Blume.

Trees with bisexual flowers in axillary cymes. Calyx cup-shaped. 5-6 toothed. Petals 5-6, valvate, distinct, hairy within. Stamens 5-6, opposite the petals and concealed by them. Ovary 1-celled, superior with 2-3 ovules in each cell. Drupe surrounded by the accrescent disk.

147 **A. densiflora.** Bedd. Fl. Br. Ind. i. 580. Bedd. Fl. Syl. t. 138. Gamble Man. Tim. 164. Tam. *Káttu vekkáli: kal pottan.* Mal. *Kal mánikkam: kaiadi: malam kára: netta madakku.*

Leaves entire, ovate, very glossy, dark-green above, pale beneath, 3-6 in. by 1½-2 in. Petiole about ½ in. Flowers about 10 together, closely packed, white, fragrant, and very abundant, about ¼ in. long and broad. Fruit globose, ¾ in. diameter.

A lofty straight-stemmed tree, very common in our evergreen forests between sea level and 2,500 ft.: yet found only on the Anamallays outside our limits. Height 90 ft. Diameter 2 ft.

Flowers September—January. Fruits ripen April—June.

Bark smooth, mottled yellow, brown and white, more than ½ in. thick. Wood greyish-pink, straight-grained and even, moderately hard and smooth. No heart. Pores middle-sized, very numerous, running in radial lines. Rays extremely fine. Annual rings indistinct.

W. = 46 lbs. P. = 630.

The wood is not used. It is said to split badly.

3. GOMPHANDRA. Wall.

Trees with polygamo-diœcious flowers in small paniculate clusters. Calyx minute, 4-5-toothed. Petals 4-5, connate into a tube, glabrous within. Stamens 4-5, alternate with the petals. Disk small, annular. Ovary 1-celled with 2 ovules. Drupe capped with the persistent, flat stigma.

G. axillaris Wall. Fl. Br. Ind. i, 586. Bedd. Fl. Syl. lxi. Trimen. Fl. Cey. i 20. Gamble Man. Tim. 166. 148

Leaves oval or lanceolate, tapering to the base, obtuse entire, glabrous, very dark-green, 2-5 in. by $\frac{3}{4}$-2 in. Petiole $\frac{1}{3}$ in. Flowers greenish-white 4-20 together, $\frac{1}{4}$ in. long. Drupe ovoid, smooth, white, $\frac{1}{2}$ in. long.

A small tree very common in our evergreen forests between 2,000 and 5,000 ft. Occurs also in Northern and Western India, Malabar and Ceylon. Height 30 ft. Diameter 10 in.

Flowers in December—January. Fruit ripens May—June.

Bark thin, grey and smooth. Wood grey, soft, loose-grained and very perishable. Pores medium to small, numerous. Rays broad and conspicuous. Annual rings indistinct.

W.=30 lbs. P.=358.

The wood is quite useless.

Brandis (Ind. Trees 151) considers that this tree has been wrongly named and that our species is, *G. polymorpha.* Weight.

4. APODYTES. E. Meyer.

Trees with bisexual flowers in terminal or axillary cymes. Calyx 5-lobed. Petals 5, free, valvate. Stamens 5. alternate with the petals. Ovary 1-celled with 2 ovules. Drupe small, oblique.

Leaves obtuse, margins revolute. Ovary hairy. . 1. *A. Benthamiana.*

Leaves acuminate, margin flat. Ovary glabrous . 2. *A. Beddomei.*

1. **A. Benthamiana.** Weight. Fl. Br. Ind. i. 588. Bedd. Fl. Syl. t. 140. (Var. b). Gamble Man. Tim. 166. Brandis Ind. Trees 152. 149

Leaves oblong, obtuse, with revolute margins, glabrous, 3-4 in. by 1-1$\frac{1}{2}$ in. Petiole $\frac{1}{2}$-1 in. Flowers white, $\frac{1}{4}$ in. long, in short, rigid, terminal panicles. Ovary hairy. Drupe ovoid, reniform, $\frac{3}{4}$ in. by $\frac{1}{2}$ in., with a lateral appendage.

A tree of medium size found in the evergreen forests at high elevations, above 5,000 ft. in Travancore, South India and perhaps in Ceylon. (See Trimen. Fl. Cey. i. 262). Height 40 ft. Diameter 1 ft.

Flowers in February.

Nothing is known of this tree or its uses.

2. **A. Beddomei,** Mast. Fl. Br. Ind. i 588. Bedd. Fl. Syl. t. 140. Var. a. Gamble Man. Tim. 166. Brandis Ind. Trees 152 150

Leaves broadly ovate, acuminate with flat margins, 3-4 in. by 1$\frac{1}{2}$-2 in. Petiole $\frac{1}{4}$-$\frac{1}{2}$ in. Flowers white, $\frac{1}{6}$ in long, in ample panicles. Ovary glabrous. Drupe $\frac{3}{8}$ in., wrinkled, oblique.

A handsome tree of medium size occurring in the evergreen forests at 2-3,000 ft. at Mahendragheri and elsewhere in South Travancore, also found in Tinnevelly and the Western Ghats.

The timber and its uses are unknown. Closely allied to this tree is Sarcostigma Kleinii, W. and A. Mal. Odal, a large climber from whose seeds a lamp-oil is obtained.

5. MAPPIA. Jacq.

Trees with bisexual (or polygamous) flowers in terminal cymes. Calyx 5-toothed. Petals, 5, connate below, hairy within. Stamens 5, alternate with petals, free, inserted outside the disk. Ovary superior, 1-celled with 2 ovules.

151 **M. fœtida**, Miers, Fl. Br. Ind. i. 589. Bedd. Fl. Syl. t. 141. Trimen Fl. Cey. i. 262 (under *M. ovata*) Gamble Man. Tim. 166. Brandis Ind. Trees 151. Tam. *Aráli*: *chorla.*

Leaves 3-8 in. by 2-3 in., ovate, acute at both ends, entire, pubescent when young, at length glabrous. Petiole ½-2 in. Cymes about 3 in. long, flowers very fœtid, cream-coloured, ¼ in. across. Drupe oblong, obtuse, reddish-purple, ¾ in. long.

A tree of medium size abundant in the evergreen forests at all elevations up to 4,000 ft. or higher. At the lower elevations it is seldom more than a shrub. Height 30 ft. Diameter 9 in. Occurs also in the Western Peninsula and in Ceylon.

Flowers in June—July. Fruit ripens September-October.

"Bark greenish grey, rough. Wood white or greyish, soft. Pores moderate-sized, very scanty in radial strings. Medullary rays numerous, broad, prominent in the silver grain."

W=32 lbs. (Gamble.)

In the Fl. Br. Ind. *M. tomentosa*, *M. ovata* and *M. oblonga* are given as distinct species in addition to the above, but both Trimen and Brandis consider them all to belong to the same.

ORDER XXV.—ILICINEÆ.

Trees with alternate, simple, exstipulate leaves. Flowers small, regular, diœcious in axillary cymes. Calyx deeply 4 or 5 fid, segments imbricate, persistent. Petals connate into a 4 or 5 lobed corolla. Stamens 4 or 5, adhering to the base of the corolla and alternate with the petals. No disk. Ovary free, 3-6 celled with 1 pendulous ovule in each cell. Stigma large, sessile. Fruit a drupe with 4-6 stones. Albumen fleshy.

A small Order containing several species found on the Neilgherries and the Western Ghats, but only one has been recorded from Travancore. To this Order belong the English Holly *Ilex Aquifolium* and the Paraguay Tea *I. Paraguayensis.*

ILEX. Linn.

Characters of the Order.

152 **I. Wightiana**, Wall. Fl. Br. Ind. i. 603; Bedd. Fl. Syl. LXII; Trimen Fl. Cey. i. 265; Gamble Man. Tim. 169; Brandis Ind. Trees 156.

Leaves 1½-3 in. by 1-1½ in. oval, acute, tapering to the base, entire and glabrous. Petiole ¼ in. Flowers white, ¼ in. long, in short cymes about 1½ in. long. Drupe globose, red, ¼ in. diam.

A large tree seen by me in evergreen forest at 4000 ft. on the Peermed plateau near Mlaparei. Occurs also on the Neilgherries and in Ceylon.

Flowers and fruits in January-February.

Gamble says that the bark is ½ in. thick. smooth and greyish white. Wood greyish white and soft. Pores very small, numerous, in radial lines. Rays long, fine and broad, dark, giving a silver-grain, and he gives

W. = 38 lbs.

Beddome says that the wood is useful for building purposes.

ORDER XXVI CELASTRACEÆ.

Trees with simple, opposite or alternate leaves, with or without stipules. Flowers regular, bisexual. Calyx 4 5 lobed, persistent, lobes imbricate. Petals 4-5, imbricate. Disk large, often lobed. Stamens 3, 4 or 5, inserted on or round the disk, alternate with the petals. Ovary sessile, free or immersed in the disk, 2-5 celled with 2 or more erect ovules in each (rarely 1, pendulous). Fruit a 2 5 valved capsule or 1 seeded drupe; seed with an aril or none, some times winged.

A large Order containing 8 trees wild in our forests. Many others have been found on the Western Ghats, some of which pro bably occur in Travancore.

Leaves opposite, stipules minute or 0.
  Fruit a capsule.
    Ovules 1-2 in each cell.
      Capsule 5-valved with several seeds immersed in aril.
      Petals 4-5. Ovules 2 in each cell . 1. *Euonymus.*
      Petals 4 Ovule 1 in each cell . 2. *Glyptopetalum.*
    Capsule 2-valved, 1-seeded, without an aril. 3. *Microtropis.*
  Ovules 4 or more in each cell . 4. *Lophopetalum.*
Fruit a drupe.
  Disk small. Stamens round the disk . 5. *Pleurostylia.*
  Disk large. Stamens on the disk . 6. *Elæodendron.*
Leaves alternate, stipules large . 7. *Kurrimia.*

1. EUONYMUS. Linn.

Trees with opposite leaves and deciduous stipules. Flowers in axillary cymes. Calyx lobes and petals 4-5. Stamens 4 5, inserted on the lobed disk and alternating with petals. Ovary immersed in the disk, 3 5-celled with 2 ovules in each. Capsule angled, seeds with an aril.

Leaves ovate, serrate towards apex. Peduncles 1-7 flowered . 1. *E crenulatus.*
Leaves lanceolate, entire, Peduncles many-flowered. 2. *E dichotomus.*

1. **E. crenulatus.** Wall. Fl. Br. Ind. i 608. Bedd. Fl. Syl. t. 144. Gamble Man. Tim. 170, Brandis Ind. Trees 158. 153

Leaves 2-3 in. by 1-1½ in. ovate, serrate towards the apex. Petiole ¼ in. Flowers reddish, ⅓ in. across, on 1-7-flowered cymes. Capsule turbinate, scarlet, ½ in. long.

A small evergreen tree found occasionally in our evergreen forests between 1,000-4,000 ft. Occurs also on the Neilgherries and other hill forests of Southern India.

Gamble says that the " bark is grey, smooth. Wood light brownish-white, moderately hard, even grained. Pores extremly small and numerous, evenly distributed. Rays very fine, very numerous. Annual rings marked by a dark line," and he gives

W. = 47 lbs.

Beddome suggests that the wood might be used for wood-engraving.

2. E. **dichotomus**, Heyne. Fl. Br. Ind. i. 609. Bedd. Fl. Syl. lxiii. Gamble Man. Tim. 170. Brandis Ind. Trees 158. Tam. *Vini : malei kuratttha.*

Leaves $1\frac{1}{4}$-3 in. by $\frac{1}{2}$-1 in. lanceolate, entire, succulent, round at both ends. Petiole $\frac{1}{4}$-$1\frac{1}{4}$ in. Flowers in axillary cymes 2 in. long, each flower 1/10 in. diam. pale green. Capsule turbinate.

154 A small tree with drooping, glossy leaves and the habit of a weeping willow. Height 30 ft. Trunk very thick, up to $2\frac{1}{2}$ ft. diam with a deeply cracked, brown bark. Common in waste land between Aramboli and Panagudi and sometimes planted as an avenue tree. Found by Beddome on the Anamallays and elsewhere on the hills of South India up to 5,000 ft. Flowers in March.

Beddome says that the " wood is very hard close-grained, and answer as a substitute for box in wood engraving."

2. GLYPTOPETALUM, Thw.

Small trees with opposite leaves, and bisexual flowers in supra-axillary cymes. Calyx 4-lobed. Petals 4, with 2 deep pits on the upper surface. Disk large, quadrangular. Stamens 4, inserted at angles of disk. Ovary 4 lobed, 4 celled with 1 pendulous ovule in each cell. Fruit capsular, 1-4 celled. Seeds nearly covered by aril.

155 G. **zeylanicum**, Thw. Fl. Br. Ind. i. 612. Bedd. Fl. Syl. xiv. Trimen Fl. Cey. i. 268. Gamble Man. Tim. 172. Brandis Ind. Trees 159.

Leaves 4-6 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in. glabrous, lanceolate, tapering at both ends, serrate or entire. Petiole $\frac{1}{4}$ in. Flowers pale greenish-yellow, $\frac{1}{3}$ in. across. Capsule 1-4-lobed, green, smooth : seeds $\frac{1}{2}$ in. ovoid, aril crimson.

A small tree up to 30 ft. high found by Beddome in our evergreen forests between 2-3,000 ft. Occurs also on the Anamallays, in Tinnevelly and Ceylon.

Flowers in February.

The wood is unknown.

3. MICROTROPIS, Wall.

Small trees with opposite leaves and bisexual (sometimes unisexual) flowers in small clusters. Calyx-lobes rounded, imbricate. Petals 5, connate at the base. Disk annular, slightly lobed. Stamens

5 on upper edge of disk. Ovary free, 2-celled with 2 ovules in each cell. Capsule 2-valved. 1-celled and 1-seeded : aril none.

M. Wallichiana, Wight. Fl. Br. Ind. i. 613. Bedd. Fl. Syl. lxv. Trimen Fl. Cey. i. 269. Gamble Man Tim. 173. Brandis Ind. Trees 160. 156

Leaves 3-8 in. by 2-3½ in. lanceolate or ovate, acuminate, entire, bright green above, pale beneath. Petiole ¼ in. Flowers white, 1/12 in. across, sessile. Capsule oblong, apiculate, ½ in. long, white with a scarlet testa.

A small tree up to 30 ft. high, found by me in the evergeen forests about Ponmudi, 3000 ft and said by Beddome to be common throughout the Western forests of this Presidency and in Ceylon.

Flowers Feb.—April.

The wood is unknown.

4. LOPHOPETALUM, Wight.

Trees with opposite leaves, and bisexual flowers in branched cymes. Calyx 5-lobed, lobes short. Petals 5, persistent, crested. Disk 5-lobed, large flat. Stamens 5, subsessile, inserted on disk. Ovary triquetrous, 3-celled, with 6-12 ovules in each cell. Capsule 3-valved containing many winged seeds.

L. **Wightianum**, Arn. Fl. Br. Ind. i. 615. Bedd. Fl. Syl. t. 145. Gamble Man. Tim. 174. Brandis Ind. Trees 171. Tam *Ven. kottei* Mal. *Venkotta* : *venkadavan*. 157

Leaves 3-9 in. by 1½-4 in. oblong, entire, very glabrous, pale when young, dark green when mature. Petiole ⅓ in. Cymes 6-8 in long Flowers ¾ in across, yellow and dark crimson. Capsule brown, smooth, pointed at both ends, 3-angled and 4-6 in, long. Seeds brown, thin, 2 in. long by ½ in. broad.

A lofty tree common in the evergreen forests and on river banks at low elevations throughout Travancore sometimes ascending to 2000 ft. Height 100ft. Diam 3 ft. Found also in Malabar and elsewhere on the Western Coast.

Flowers December—February. Fruit ripens June—July.

Bark smooth, mottled brown and white. Wood reddish-white, even, close grained and moderately hard. No heart. Pores medium to large often divided, sometimes in strings. Rays fine and difficult to see, bent round the pores and crossed by lines of white tissue. Annual rings not seen.

W = 30 lbs. P = 467.

The tree grows fast and could easily be propagated. Its timber is straight-grained and easily worked, and if it were more durable there would be a great demand for it, but it is eaten by white ants and bored by beetles. It is used for packing-cases, for rafters of houses and for planking. It lasts longer if smoked.

5. PLEUROSTYLIA, Wight.

Small trees with opposite leaves, and bisexual flowers in axillary cymes. Calyx cup-shaped with 4 or 5 shallow lobes. Petals 5.

Disk small, lobed. Stamens 5, outside the disk. Ovary half-immersed, 2-(or 1) celled. Ovules 2 in each cell. Fruit a drupe. Seed solitary, erect, covered by the aril-like endocarp.

158 **P. Wightii,** W. and A. Fl. Br. Ind. i. 617. Bedd. Fl. Syl. lxvi. Trimen Fl. Cey. i. 271. Gamble Man. Tim. 175. Brandis Ind. Trees 165

Leaves entire, oblong, tapering to base, glabrous, 1–3 in. by $\frac{1}{2}$-1$\frac{1}{2}$ in. Petiole $\frac{1}{4}$ in. Flowers 10 or 12 together, pale green. $\frac{1}{8}$ in. across Drupe ovoid, white, $\frac{1}{4}$ in. long.

A small tree with delicate foliage, not unlike the sandal wood, found in the drier parts of the evergreen forests near Ariankavu, rare. Height 30 ft. Diam. 1 ft. It occurs also on the Western Coast, in Ceylon, Mauritius and Madagascar.

Flowers in July. Fruits in September to October.

Gamble says that the bark is $\frac{1}{3}$ in. thick and grey: inner bark yellow. Wood light red or greyish, moderately hard, close-and even-grained. Pores very small, scanty. Rays fine, very numerous and equidistant, and he gives

W = 48 lbs.

The wood is said to be used for combs in Cuddapah.

6 ELÆODENDRON, Jacq. fil.

Trees with opposite leaves and bisexual rarely unisexual flowers in axillary cymes. Calyx deeply 5-fid. imbricate, Petals 5, spreading, imbricate. Disk large, tumid. Stamens 5 inserted on the disk. Ovary immersed in disk, 2-celled with 2 erect ovules in each cell. Drupe 1-celled, 1-seeded. No aril.

159 **E. glaucum,** Pere. Fl. Br. Ind. i. 623. Bedd. Fl. Syl. lxvii and t. 148 (under *E. Roxburghii*) Trimen Fl. Cey. i. 271. Gamble, man. Tim. 178. Brandis Ind. Trees 164. Tam. *Karuvâli.*

Leaves 2–6 in. by 1–2$\frac{1}{2}$ in. oval, acute at base, crenate or entire glabrous and coriaceous. Petiole about $\frac{1}{2}$ in. Cymes about 3 in. long, flowers yellowish-green, $\frac{1}{4}$ in. across. Drupe ovoid, apiculate, $\frac{1}{2}$ in. long, yellowish-green and smooth.

A small tree of the drier parts, such as Puliyara, at 1000 ft. elevation, but, when found in the evergreen forest at 2000-3000 ft., growing to a large size, rare. Beddome considered the two varieties to be different species, and has described them as *E. glaucum* and *E Roxburghii* but Trimen and others regard them only as varieties of the same species. Height 80 ft. Diameter 2 ft. Found throughout India and Ceylon and in Malaya.

Flowers and fruits from July to October and probably through the year.

Gamble says that the bark is $\frac{1}{6}$ in. thick, grey and often blackish. Wood moderately hard, even and close-grained, light brown often with a red tinge. the outer wood white: no annual rings. Numerous wavy, light coloured bands. Pores small, scanty. Rays fine, short and very numerous giving a silver grain and he gives.

W = 53 lbs. P = 512.

The wood is "beautifully curled and flaked, and takes a good polish." It seasons well, and in other parts of India it is used for cabinet work and picture frames. The root-bark is used in native medicine and is highly astringent, (Pharm. Ind. ii. 346).

7 KURRIMIA, Wall.

Trees with alternate leaves and large stipules: Flowers bisexual, sessile in terminal, erect panicles. Calyx deeply 5-fid imbricate. Petals 5 imbricate. Disk small cup-shaped, 5-lobed. Stamens 5 inserted under the margin of disk: Ovary free, 2-celled with 2 erect ovules in each cell. Fruit a leathery capsule, 2-valved, 1-3-seeded, seeds covered with a fleshy aril.

K. bipartita, Lawson. Fl. Br. Indi i. 622 (under *K. paniculata*) Bedd. Fl. Syl. t. 120 (under *Trochisandra indica*) Gamble Man. Tim. 177. Brandis Ind, Trees 164. Tam. *Kadaplá*. 160

Leaves 4-12 in. by 2-4 in., ovate, glabrous, penniveined, pale when young, dark-green when old, with 15-20 pair strongly marked, secondary veins. Petiole 1-1½ in. Flowers subsessile, ⅓ in. across, pale yellow. Capsule 2-lobed, 1½ in. long, flattened-ovoid, reddish brown: aril white.

A very large tree common in the evergreen forests of Peermed and elsewhere at elevations between 3000 and 5000 ft. Confined to Southern India, being quite distinct from the Malayan *K. Indica* Height 100 ft. Diameter 2½ ft.

Flowers December—January. Fruits in March.

Bark ⅓ in. thick. Wood pale greyish-brown, uniform but rough, moderately hard: no heart. Pores small few. Rays very fine and close together, bent round the pores. Annual rings indistinct marked by dark bands without pores, about 12 to inch.

W = 40 lbs. P = 505.

The timber has not been used.

ORDER XXVII. RHAMNACEÆ.

Erect trees or scandent shrubs. prickly, spinuous or unarmed, with simple, alternate leaves and small stipules. Flowers small, regular, bisexual or unisexual. Calyx 4-5-fid, lobes valvate. Petals 4-5, inserted at mouth of calyx-tube or on edge of disk. Disk small, Stamens 4-5, opposite petals. Ovary 2-4 celled with 1 erect ovule in each cell. Fruit a drupe or capsule.

An Order of no importance for its timber, and containing only 5 small trees found within our limits. These are, however, very common and are of economic use.

Fruit a fleshy drupe: stone 1-4-celled: ovary half-inferior	1. *Zizyphus*.
Fruit a berry with 3-4 pyrenes: ovary superior	2. *Rhamnus*.

1. ZIZYPHUS, Juss.

Small trees with alternate, 3-veined leaves, armed or unarmed. Flowers in axillary clusters or paniculate cymes. Calyx-tube obconical. Petals 5 or 0 Disk 5-or 10-lobed. Stamens 5. Ovary half-inferior, 2-4-celled. Drupe 1-4 seeded.

Flowers in short, axillary cymes. Petals 5.
Styles connate half way up. Ovary 2-celled.
Armed trees. Leaves tomentose beneath. 1. *Z. jujuba.*
Unarmed trees. Leaves wholly glabrous. 2. *Z. trinervia.*
Styles free. Ovary 3-celled. 3. *Z. xylopyra.*
Flowers in pedunculate cymes, terminal or lateral.
Petals 0. 4. *Z. rugosa.*

161 1. **Z. Jujuba, Lamk,** Fl. Br. Ind. i. 632. Bedd. Fl. Syl. t. 149, Trimen Fl. Cey. i. 280. Gamble Man. Tim 181. Brandis Ind. Trees 169. Eng. The *Jujube tree.* Tam. *Ilanthei.*

Leaves 1-3 in. by ¾-2 in., oval, rounded at both ends or acute, irregularly serrulate or entire glabrous above, covered with white or buff-coloured tomentum below, prickles short and sharp. Petiole 0 or ½ in. Cymes ⅜ in. long. Flowers greenish-white, ¼ in. across: styles connate, Drupe globose or ovoid, fleshy, smooth, yellowish-red, ½ in. long.

A medium-sized tree, 30-50 ft. high, found both wild and cultivated in the drier parts of South Travancore, but perhaps not indigenous there. Cultivated and wild through India, also in Ceylon China and Australia.

Flowers April—December. Fruits December—March.

Gamble says that the bark is ⅓ in. thick, nearly black and cracked. Wood hard, reddish: no heartwood. Pores small or moderate-sized, scanty, often joined by fine, concentric lines. Rays fine, very numerous and uniform, and he gives as an average.

W = 48 lbs. P = 583.

He also says that it is "an important tree in the dry regions, as" "it comes up readily and easily on poor land and grows quickly," "furnishing an excellent fuel, much material for hedging, food for" "camels and goats in its leaves, and for man in its fruit." The wood is used for "saddle trees, agricultural implements and other purposes." The lac insect is found upon it, and the leaves are eaten by Eri and tasar silkworms. The fruit is eaten both fresh and dried. An oil is extracted from the kernel (Brandis). The leaves and bark are used medicinally and the root bark for tanning (Pharm Ind. ii. 350). The tree coppices well.

162 2. **Z. trinervia**, Roxb. Fl. Br. Ind. i. 643. (Under *Z glabrata.*) Bedd. Fl. Syl. lxviii. Gam. Man. Tim. 182. Brandis Ind. Trees, 171. Tam. *Kottei.*

Leaves 1-5 in. by ½-2½ in. oval, glabrous on both sides dark-green and glossy, serrate, unarmed. Petiole ¼ in. Cymes ½ in. long. Flowers greenish-yellow, ¼ in. across. Styles connate. Drupe globose, yellow. ¾ in diam.

A small tree found, like the last, in south Travancore in waste land, and growing to a height of 20-30 ft. It occurs also along the Western coast, but is not found in Ceylon. Gamble says that the wood is "hard, close-grained olive brown, smooth. Pores moderate-sized. Rays fine, white and distinct," and he gives

W = 70 lbs.

The wood is tough, and is used in Travancore for paddy-pounders.

3. **Z xylopyra**, Willd. Fl. Br. Ind, i. 634. Bedd. Fl. Syl. lxviii. Trimen Fl. Cey. i. 282. Gamble Man. Tim. 183. Brandis Ind. Trees 171 Tam. *Kottei.* 163

Leaves $1\frac{1}{2}$-3 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. oval, unequal-sized, cordate at the base. finely serrate, glabrous above, covered with white or yellow tomentum beneath. Petiole $\frac{1}{4}$ in. Prickles generally in pairs, one straight. the other curved, sometimes absent. Cymes woolly, 1 in. long. Flowers greenish, $\frac{1}{4}$ in. across. Styles free Drupe ovoid, $\frac{3}{4}$ in. long, greenish grey downy.

A small tree with woolly-pubescent branches, up to 20 ft. high and 9 in. diam. found in our subalpine deciduous forests everywhere. Occurs elsewhere through India and in Ceylon.

Flowers April-June. Fruits Sep.-Feb.

Gamble says that the "bark is grey or reddish-brown, Wood" "yellowish-brown with a small dark-coloured centre. hard. Pores" "small and moderate-sized. Rays fine and very numerous. Annual" "rings not prominent," and he gives

W=50 lbs. P=800.

"The fruit is not edible, but is used in tanning to give a black" "dye to leather. In some parts of the Central Provinces it is the" "chief tree to give lac." (Gamble). (Pharm Ind. ii. 351).

4. **Z. rugosa** Lamk. Fl. Br. Ind. i. 636. Bedd. Fl Syl. lxviii. Trimen Fl. Cey. i. 282. Gamble Man. Tim. 184. Brandis Ind. Trees 171. Mal. *Thodali.* 164

Leaves 2-6 in. by 1-3 in. oval, serrate. unequal, when young pubescent beneath, at length glabrous on both sides. Petiole $\frac{1}{3}$ in. Armed with short, recurved. often solitary, spines. Cymes large, axillary and terminal, forming a long compound panicle. Flowers greenish, very small. Petals none. Drupe $\frac{1}{2}$ in. long. pyriform, smooth.

A small tree 30 ft. high and 9 in. diam., more often a straggling bush, common in the deciduous forests at low elevation through Travancore. Found through India and Ceylon.

Flowers November-March. Fruits April-May.

Gamble says that the "bark is rough and dark. Wood reddish" "and moderately hard. Pores large and moderate-sized, often" "joined by faint concentric lines. Rays fine and extremely" "numerous," and he gives

W=45 lbs.

"troublesome, thorny climber of no use: the wood is used for" "fuel, and the fruit said to be eaten, but I imagine it is rather too" "dry." (Gamble).

The bark is used as an astringent in diarrhœa (Pharm Ind. ii 351).

2. RHAMNUS. Linn.

Small trees with penninerved leaves, alternate or opposite, armed. Flowers in axillary clusters, bisexual or unisexual. Calyx 4-fid

lobes keeled within. Petals 4, minute. Disk thin, lining the calyx-tube with petals and stamens on its edge. Stamens 4. Ovary free, 3-4 celled. Fruit a berry with 3-4 pyrenes.

65 **R virgatus**, Roxb. Fl. Br. Ind. i. 639. (under *R dahuricus*). Bedd. Fl. Syl lxx. (Under *R. hirsutus*) Gam. Man. Tim. 185. Brandis Ind. Trees 172.

Leaves 1-4 in. ovate or obovate, acuminate-serrate, glabrous, generally opposite, branches spinescent. Petiole $\frac{1}{3}$ in. Flowers greenish on slender pedicels, petals spathulate. Berry 1/5 in long, seed grooved.

A small tree, 20 ft. high, not uncommon on the Tinnevelly hills and other mountain ranges of Southern India, and probably to be found in Travancore, though I have not seen it. Occurs through India and Burmah, but not in Ceylon.

Flowers April-June. Fruits Oct.-Dec.

Gamble says that the bark is thin, grey to black, and smooth. Wood very hard, close-grained : sapwood whitish ; heartwood brown. Annual rings distinctly marked. Pores very small, arranged so as to form an irregular net work. Rays fine and very numerous, and he gives.

W=58 lbs.

"Wood not used, except as fire wood. The fruit is bitter, emetic and purgative, and is given in affections of the spleen." (Gamble). The bark is supposed to yield the "Lokoo" dye of China which imparts beautiful shades of green to silk (Dict. Econ. Prod.)

ORDER XXVIII. AMPELIDEÆ.

Small trees or shrubs, usually climbing, with alternate, simple or compound, stipulate leaves. Flowers small, regular, bisexual (rarely unisexual). Calyx cupshaped, 4-5-lobed. Petals 4-5, valvate. Stamens 4-5, opposite petals, free or connate into a tube. Disk large, cup shaped or annular. Ovary 2-celled with 2 ovules in each, or 6-celled with 1 ovule. Fruit a berry.

An Order consisting chiefly of climbers, but containing one very common small tree of no value for its timber.

LEEA, Linn.

Leaves bi-or- tri-pinnate. Flower bisexual in terminal or leaf-opposed cymes. Calyx 5-toothed. Petals 5, connate into a tube. Stamens 5, adnate to the petals. Disk 5-lobed. Ovary 6-celled with 1 ovule in each cell.

166 **L. Sambucina**, Willd. Fl. Br Ind. i. 666. Brandis For. Fl. 108. Trimen Fl. Cey. i. 297. Gamble Man. Tim. 191. Tam. *Nyekki : otta nali*. Mal. *Nyeru: maniperandi*.

Leaves 2-2$\frac{1}{2}$ ft. long, glabrous, with 2-3 pair pinnæ. Leaflets lanceolate, coarsely serrate, acuminate, about 6 in. by 4 in. with large stipules. Flowers green and white in large cymes, $\frac{1}{4}$ in. across. Fruit $\frac{1}{3}$ in. diameter, depressed globose, smooth black.

A very common tree, sometimes growing to a height of 30 ft but generally only a shrub, found in all our evergreen forests up to 4,000 ft. Occurs also through India and in Ceylon, China and Australia.

Flowers and fruits all the year round.

ORDER XXIX. SAPINDACEÆ.

Trees with alternate, rarely opposite, leaves, usually without stipules, and generally compound. Flowers small (large in *Harpullia*)

regular or irregular, polygamous or diœcious (bisexual in *Turpinia*). Sepals 4-6. Petals 4-5 or 0, distinct, sometimes unequal. Disk annular or one-sided. Stamens 5-10 (generally 8) inserted inside the disk. Ovary 2-3 celled with 1-2 or more erect ovules in each cell. Fruit capsular or indehiscent. Seed with or without an aril.

An important Order containing about 9 trees indigenous in Travancore some of them of large size and yielding hard, useful wood. The 'Longan" *Nephelium longana* is wild in our forests and is a common tree, but its fruit is tasteless. The delicious "Litchi" which is sometimes cultivated in gardens is the fruit of *N. Litchi*, a Chinese tree. This order includes the Maples (*Acer*) so conspicuous a feature of the forests of North America and Europe.

Leaves alternate, without stipules.
  Flowers irregular; disk one-sided.
    Leaves pinnate ... . 1. *Hemigyrosa.*
    Leaves trifoliolate.. .. .. .. 2 *Allophyllus.*
  Flowers regular; disk annular.
    Stamens inserted inside the disk. Fruit not winged.
      Flowers very small. Fruit not inflated.
        Petals 0 .. .. 3. *Schleichera.*
        Petals 5-8.
          Sepals much imbricated .. 4. *Sapindus.*
          Sepals valvate .. .. 5. *Nephelium.*
      Flowers large. Fruit an inflated capsule 6. *Harpullia.*
    Stamens inserted outside the disk. Fruit 3-winged 7. *Dodonœa.**
Leaves opposite, stipulate .. .. 8. *Turpinia.*

1. HEMIGYROSA, Blume.

Trees with abruptly pinnate, exstipulate leaves, and polygamous diœcious, irregular flowers. Sepals 5, unequal, imbricate. Petals 4-5 imbricate, with a scale at the base of the claw. Disk one-sided. Stamens 6-10, distinct, woolly Ovary excentric, 3-celled with 1 ovule in each cell. Fruit indehiscent, 1-3-seeded.

H deficiens, Bedd. Fl. Br, Ind. i. 671. Bedd. Fl. Syl. lxxii 167
(under *Anomosanthes deficiens*). Gam. Man. Tim. 192. Brandis Ind. Trees 189 (under *Lepisanthee deficiens*).

Leaves 12-15 in. long, of 8-14 lanceolate, acuminate, entire, glabrous leaflets, each 5-9 in. by 1-2½ in. Racemes axillary drooping 6-24 in. long. Petals ⅓-½ in. across, purple or white, calyx white, very woolly. Fruit 3-angled, seed without an aril.

A small tree found in the evergreen forests through Travancore, at elevations from 0-4,000 ft. Height 25 ft. Diameter 10 in. It has only been met with in the Southern Peninsula, on both sides of the Ghats, as far north as the Anamallays.

Flowers in July.

"Bark ⅛ in. brown, smooth. wood extremely hard and cross-grained pale yellow tinged with grey. Pores small and few. Rays fine and indistinct, crossed by numerous wavy concentric lines of darker tissue.

W=53 lbs P=428.

*Some Botanists place Turpinia in a different order, Staphyleaceæ, on account of its opposite stipulate leaves.

† It also flowers in Feb.—Mar."

2. ALLOPHYLLUS, Linn.

Small trees with alternate, exstipulate, trifoliolate leaves, and polygamo-dioecious, irregular flowers in racemes. Sepals 4, unequal, imbricate. Petals 4, usually with a scale attached. Disk one-sided, 4-lobed. Stamens 8, distinct. Ovary 2-lobed, 2-celled with one ovule in each cell. Fruit indehiscent.

168 **A. Cobbe**, Blume. Fl. Br. Ind. i. 673. Trimen Fl. Cey. i. 303. Bedd. Fl. Syl. lxxii (under *Schmidelia Cobbe*). Gamble Man. Tim. 193. Brandis Ind. Trees 185. Mal *Mukannan peru*.

Leaves 3-foliolate, 4-12 in. long, very pubescent, leaflets 1-10 in. by $\frac{1}{2}$-4 in. oval-acuminate, faintly serrate, subsessile. Petiole 5-4 in. very pubescent. Flowers very small, greenish, crowded on slender racemes, 2-6 in. long. Fruit $\frac{1}{4}$ in. diam. ovoid (or didymous) red, shining.

A large bush, sometimes a small tree, very common in all our ever-green forests at low elevations. Height 20 ft. Diam. 5 in. Occurs also through Southern India and in Ceylon, Malaya and Tropical Australia.

Flowers in April-June. Fruits May-July.

Gamble says that the bark is dark grey and the wood grey and moderately hard, with small scanty pores and very fine rays, and he gives:

W=40 lbs.

The wood is said to be used for bows in Ceylon, and the fruit is eaten.

3. SCHLEICHERA, Willd.

Large trees with alternate, exstipulate, abruptly-pinnate leaves. and regular, polygamo-dioecious flowers Calyx 4-6-fid, cup-shaped. Petals 0. Disk flat, distinctly lobed. Stamens 5-8, inserted within the disk. Ovary 3-celled with 1 ovule in each cell. Stigma 3 lobed. Fruit indehiscent, 1-2 seeded. Seeds enveloped in a fleshy aril.

169 **S. trijuga,** Willd. Fl. Br. Ind. i. 681. Bedd. Fl. Syl t. 119. Brandis For. Fl. 105. Trimen Fl. Cey. i. 304. Gamble Man. Tim. 194. Eng. *The Ceylon oak*. Tam. *Púvan*. Mal. *Púvom*.

Leaves 8 12 in. long. of 4-8 opposite. entire, subsessile, glabrous leaflets, obtuse-oblong, each 2-6 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in., the inner pair much smaller. Flowers greenish yellow, $\frac{1}{4}$ in. across, in lax spicate panicles 2-6 in. long. Fruit globose, sharply pointed, smooth, often with a few short spines, $\frac{3}{4}$ in. diam. greenish, drying to pale brown.

A very large handsome tree of great girth, trunk often fluted, common in all our deciduous forests from 0-2,000 ft. Occurs also through India and in Burmah, Ceylon and Java. Height 80 ft. diam 4 ft. Often planted.

Bare of leaves in Jan. Flowers come out with the young leaves in Feb.—March. Fruit in May.

Bark brown and knotted, $\frac{1}{3}$ in. thick. Wood extremely hard, light pinkish-brown, cross grained. Sapwood whitish. Pores medium-sized, evenly distributed and rather scanty. often joined by pale

wavy lines. Rays extremely fine, close together and uniform, but indistinct. Annual rings not seen.

W = 66 lbs. P = 725.

This is an important forest tree. The wood is very strong and durable, but, on account of its great hardness, it is seldom employed except for oil-mills, for which purpose it is well-suited. It yields excellent firewood and charcoal. The seeds are largely collected for the manufacture of oil. The pulpy aril of the fruit is edible. In other parts of India lac is produced from the young branches, this tree being considered the best for the purpose, and the lac from it being highly valued. Attention should be paid to the industry in Travancore. "The oil is valuable for stimulating the growth of the hair. It is said to be the chief ingredient in Macassar oil. (Dict. Econ Prod)."

4. SAPINDUS, Linn.

Trees with alternate, exstipulate, abruptly pinnate leaves, and regular, polygamous flowers in terminal or axillary panicles. Sepals 5 much imbricate Petals 5 Disk annular, fleshy Stamens 7 10 inserted within the disk. Ovary lobed, 2-3-celled with 1 ovule in each cell Fruit of 1-3 indehiscent cocci. Seeds large, without an aril.

S **trifoliatus**, Linn. Fl Br. Ind. i. 682. Bedd. Fl. Syl. t. 154. 170
and lxxiii (under *S. emarginatus* and *S. laurifolius*) Brandis For. Fl 106. 107. Trimen Fl, Cey. i 306. 307. Gamble Man Tim. 196 Eng the *Soap nut tree* Tam. *Pungan kottei*: *nithavanji*: Mal *Pasakotta*. *urulinji*

Leaves 5-12 in long, of 4-8 subsessile, opposite, lanceolate, entire leaflets, glabrous above, each 4-6 in by 2-3 in. Flowers numerous, in dense erect panicles, greenish-white, $\frac{1}{4}$ in. across. Fruit of 1-3 rounded carpels, each about $\frac{3}{4}$ in. diam pubescent and greenish-yellow.

A tree of moderate size and dense foliage, not uncommon in our open forests at low elevations, and extensively planted both for its fruit and its ornamental appearance. Cultivated through India, but wild only in S. India and Ceylon. Height 60 ft Diam. $1\frac{1}{2}$ ft.

Flowers Nov.—Dec. Fruit ripens in March.

According to Gamble the wood is yellow and hard, the pores scanty, and moderate sized, and the rays very fine and numerous. I have not examined it. Gamble quoting Skinner gives.

W = 64 lbs. P = 682.

As far as I know, the wood is not used, but the fruit is much employed for washing, as a substitute for soap. An oil is extracted from the seed which saponifies readily, and is employed medicinally and in the manufacture of soap. (Pharm Ind. ii. 367).

5. NEPHELIUM Linn.

Trees with alternate, pinnate, leaves, and regular, polygamous flowers in axillary and terminal panicles. Calyx 5-fid, valvate.

Petals 5, without scales. Disk annular, fleshy, lobed. Stamens 5- 0. Ovary pubescent, 2-3 celled, with 1 erect ovule in each cell. Fruit of 1-2 indehiscent cocci. Seed surrounded by a pulpy aril.

Leaves without stipules. Leaflets 5-11 . 1. *N. Longana.*
Leaves with stipules. Leaflets 4-6 . 2. *N. Stipulaceum.*

171 1. **N. Longana**, Camb. Fl. Br. Ind. i. 688. Bedd Fl. Syl. t. 156 (under *Euphoria Longana*). Trimen Fl. Cey' i. 309. Gamble Man. Tim. 197. Eng. *The Longan* or *Eyeball* tree. Tam. *Kátta púvan shempúvan*. Mal. *Shempúna* : *poripúna* : *múlei*.

Leaves 6-12 in. long, of 5-11 oblong-lanceolate, glabrous, sub-sessile, entire leaflets, dark green, and shinning above, each from 2-8 in. by 1-2½ in. Flowers yellowish-white, ¼ in. across. Petals narrow, equalling sepals. Fruit red-brown, globose, tubercled, ¾ in. diam. containing a shining black seed.

A moderate-sized tree, very common in all our evergreen forests from 0-5000 ft. Indigenous in the Western Peninsula and Ceylon, and cultivated through the Tropics. Height 60 ft, Diam 1½ft,

Flowers in Jan., Feb. and in June. Fruits June—July and Dec.

Bark smooth, greyish brown. Wood reddish-brown, hard. Pores small and abundant. Rays fine to very fine. No annual rings,

W=61 lbs. P=1061,

The wood is durable, but is not much used on account of the comparatively small size of the timber. The aril of the seed is edible but in its wild state is not worth tasting. " The tree is largely cultivated for its fruit in China.

172 **N. stipulaceum,** Bedd. Fl. Br. Ind. i. 690. Bedd. Fl. Syl. t. 155. Gamble Man. Tim. 198. Mal. *Páviri múlei.*

Leaves 6-14 in. long, with a pair of very large reniform stipules at the base of each. Leaflets 4-6, entire, broadly oblong, obtuse and glabrous, each 3-7 in by 2-4 in. Flowers in axillary and terminal panicles about 4 in. long, cream-colured and honey-scented, each flower ¼ in. across. Petals half the length of the sepals, early caducous. Fruit ovoid ¾ in. long, covered with weak prickles. Seed brown.

A tree of medium size with a smooth pale brown stem and drooping foliage, common in the evergreen forests at the lower elevations and ascending the hills to 3000 ft. Occurs also in the Southern Peninsula and Malabar. Height 60 ft. Diam 1¼ ft.

Flowers Feb.—March. Fruit May—June.

Bark ¼ in. thick. Heartwood bright reddish-brown, very hard, Sapwood whitish. Pores evenly distributed, of medium size, scanty, often filled with light-coloured matter. Rays extremely fine, close-packed and inconspicuous, crossed by numerous white lines. Annual rings not seen, but there are concentric bands of darker colour.

W=56 lbs. P=968.

The wood is good but is little known.

6. HARPULLIA, Roxb.

Trees with alternate, exstipulate, pinnate leaves, and regular polygamo-dioecious flowers in drooping panicles. Sepals 5, distinct, much imbricate. Petals 5, with long claws, imbricate. Disk small, 5-lobed. Stamens 5-8, inserted on the disk. Style very long. Ovary 2-celled, with 2 ovules in each cell. Fruit an inflated leathery capsule with 2-4 seeds, each with a small aril at the base.

H. cupanioides, Roxb. Fl. Br. Ind. I. 692. Bedd. Fl. Syl. t. 158. (under *H imbricata*). Trimen Fl. Cey. i. 311. Gamble man. Tim. 199. Tam. *Nei kottei*, Mal. *Chittila madakku*. 173

Leaves 6-18 in long, of 8-10 lanceolate, acute leaflets, unequal, entire, glabrous thin and pale green, each 2-8 in. by 1-4 in on short stalks. Panicles 5-12 in long. Flowers yellowish-green, ½ in. long. Capsule pendulous, scarlet, didymous. 1 in. long by ½ in. wide. Seeds black, shining. Aril orange.

A small, much branched tree, not uncommon in the evergreen forests at Ariankavu and on the Cardamom Hills at elevations between 500 and 4000 ft., seeming to prefer a somewhat dry climate. Occurs also in Malabar, Ceylon and Malaya. Height 40 ft. Diam. 1 ft.

Flowers Dec.—Feb. Fruits March—May.

Bark smooth, greenish, ⅛ in. thick. Wood white, soft, no regular heartwood. Pores few of medium size. Rays fine and numerous.

W=50 lbs. P=530.

No use is made of the timber. Trimen says that the fruit is used for washing purposes in Ceylon.

7. DODONÆA, Linn.

Small trees with simple, alternate exstipulate leaves. Flowers regular, polygamo-diœcious in terminal and axillary panicles. Sepals 5, distinct. Petals O. Disk very small. Stamens generally 8, inserted outside the disk. Ovary 3-celled with 2 ovules in each cell. Fruit a trigonous 3-winged capsule. Seeds without an aril.

D. viscosa, Linn. Fl. Br. Ind. i. 697. Bedd. Fl. Syl. lxxv Brandis For. Fl. 113. Trimen Fl. Cey. i. 312. Gamble Man. Tim. 202. Eng. *Switch sorrel*. Tam. *Virâli*. Mal. *Vrâli : krâli*. 174

Leaves 1-4 in. by ¼-1 often viscid with yellow resin, subsessile lanceolate, tapering to the base, shining, thin, entire or indented. Flowers in short, lax panicles, yellowish-green, ¼ in. across. Capsule ¾ in. long with 3 broad wings, pale brown. Seeds black.

A very common shrub in all waste places throughout Travancore, especially the drier parts, but attaining the size of a tree at the higher elevations, 5000-6000 ft. Found through India, Ceylon and Malaya. Height 20 ft. Diam. 5 in.

Flowers and fruits from Jan.-April

Gamble says that the bark is thin and grey, the wood extremely hard, dark brown and sometimes mottled with black, the pores very small and the rays fine and very numerous, and he gives

W = 76 lbs.

The growth is slow. The wood has been used as a substitute for boxwood in engraving, and for turning, tool handles &c. The plant seems to thrive on the poorest soils, and is likely to be useful in re-clothing denuded tracts. The leaves have medicinal properties. (Pharm Ind. ii. 371.) The leaves have valuable styptic properties.

8. TURPINIA, Vent.

Trees with opposite, pinnate leaves, interpetiolar stipules, and regular, bisexual flowers. Calyx deeply 5-lobed, imbricate. Petals 5, imbricate. Stamens 5, inserted outside the disk which is lobed and cup-shaped. Ovary 2-or 3-celled with 2 or more ovules in each cell. Fruit dry, indehiscent, several-seeded. Seeds angular, without an aril.

175 **T. nepalensis**, Wall. Fl. Br. Ind i 698 (under *T. pomifera*). Bedd Fl. Syl. t 159. Trimen Fl Cey. i 313. Gamble Man. Tim 203. Tam. *Kanali*. Mal *Pamba vetti*.

Leaves 6-18 in. long, of 3-9 leaflets, serrate, glabrous, oblong-acuminate, each 2-6 in. by 1-2½ in. Flowers numerous, in lax panicles, cream coloured, ⅙ in across. Fruit globose, ½-¾ in diam, purplish-brown. Seeds dark brown.

A large tree very common in our evergreen forests between 1000 and 4000 ft. and very ornamental on account of its bright yellow young leaves contrasting with the mature foliage. Occurs also in Ceylon, many parts of India, Malaya and China. Height 70 ft. Diam. 2 ft.

Flowers Dec.-March. Fruits Apr'l-June.

Bark brown, thin. Wood grey and even-grained, rather soft, no regular heart. Pores small, very numerons and evenly distributed. Rays extremely fine and abundant, or moderately broad and few. Annual rings not seen.

W = 28 lbs. P = 388.

The wood is useless.

ORDER XXX. SABIACEÆ.

Trees with alternate, simple or pinnate leaves without stipules. Flowers small, bisexual or polygamous, irregular, usually in panicles. Calyx-lobes 4-5, distinct, persistent and imbricate, often surrounded by bracteoles indistinguishable from them. Petals 4-5, distinct, unequal, 3 large and 2 small. Stamens 5, only the two opposite smaller petals fertile, filaments dilated above. Disk small, annular and toothed. Ovary 2-celled with 2 ovules in each cell. Style short. Fruit an oblique drupe, 1-celled, 1-seeded. Seed globose.

This Order contains only 3 trees wild in our forests, none of them of any value.

MELIOSMA, Blume.

Characters of the Order.

Leaves simple.

Sepals and bracteoles 9—13 .. .. 1. *M. Wightii.*

Sepals and bracteoles 5—6 .. .. 2. *M. simplicifolia.*

Leaves pinnate .. .. 3. *M. Arnottiana.*

1. **M. Wightii**, Planch. Fl. Br. Ind. ii. 4. Bedd. Fl. Syl. lxxvii (under *M pungens*). Trimen Fl. Cey. i. 314. Gamble Man. Tim 205. Brandis Ind. Tr. 194. 176

Leaves 4-8 in. by $1\frac{1}{2}$-3 in. simple, oblong, narrowed to base, acute. entire or with distant serratures, glabrous above, veins reddish and prominent beneath. Petiole $\frac{1}{2}$-1 in. Flowers subsessile in rusty panicles 6-8 in long, each $\frac{1}{20}$ in. across, pale yellow. Drupe globose, $\frac{1}{4}$ in. diam., purple-black.

A tree of medium size. 50 ft. high and $1\frac{1}{2}$ ft. diam. very abundant at the edges of sholas on the Travancore hills from 3,000 ft. upwards Occurs also in Malabar and Ceylon.

Flowers Jan.—April, and Sep. Fruit May—June and Nov.—Dec.

Bark whitish-brown. smooth and $\frac{1}{3}$ in. thick. Wood greyish-brown very soft, rough and splitting easily. No heart. but darker towards the centre. Pores numerous, large and medium-sized. Rays fine and close together. Annual rings marked by darker bands about 4 to inch.

W=31 lbs. P=370.

The wood is quite useless.

2. **M. simplicifolia**, Hook. f. Fl. Br. Ind, ii. 5. Bedd. Fl. Syl. lxxvii. Trimen Fl. Cey. i. 315. Gamble Man. Tim. 206. Brandis Ind. Tr. 194. 177

Leaves 5-16 in. by $3\frac{1}{2}$-7 in. simple oblong. much narrowed to base, acute, entire or distantly toothed, glabrous above. Petiole $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers subsessile in lax panicles, very small and yellowish-white Drupe globose, $\frac{1}{4}$ in. diam., purple-black.

A small bushy tree common in the evergreen forests of the low country and up to 2000 ft. elevation. Occurs also through India and in Ceylon.

Flowers Dec.—March. Fruits May—June.

Wood pale reddish, moderately hard. Pores small or medium-sized, numerous. Rays fine and close together, very numerous. Gamble gives.

W=36 lbs.

The wood is useless.

3. **M. Arnottiana**, Walp. Fl. Br. Ind. ii 6, Bedd. Fl Syl. t. 160. Trimen Fl. Cey. i. 315. Gam Man. Tim. 206. Brandis Ind. Tr. 195. Tam *Kusavi*: *thagari.* 178

Leaves odd-pinnate, 6-10 in. long of 9-15 leaflets, each 3-5 in. by 1-$1\frac{1}{2}$ in. lanceolate, acute, entire, glabrous above, rusty-tomentose beneath, on $\frac{1}{4}$ in. stalks. Flowers subsessile in copious, rusty panicles, small and yellowish-white. Drupe $\frac{1}{4}$ in. diam, globose,

A medium-seized tree very common on the Peermed hills and in all our evergreen forests between 2000-4000 ft. elevation. very common on the High Range from 5000 to 7C00 ft. Height 60 ft. Diam. 1½ ft. Found on all the hill-forests of S. India and in Ceylon. Very ornamental when in flower.

Bare of leaves in Jan. Flowers in April. Fruits May—June.

Bark dark-Brown, rather thick. Wood reddish brown, soft, very coarse. No heartwood. Pores of medium size and scanty. Rays of 2 kinds, one broad and distant, and the other finer and close together. Annual rings marked by darker lines, about 4 to inch.

W = 24 lbs. P 325.

The wood is useless.

Order XXXI. ANACARDIACEÆ.

Trees with alternate, simple or compound, exstipulate leaves. Flowers regular, unisexual or bisexual, sometimes polygamous, Calyx 3-5 fid (spathaceous in *Gluta*). Petals 3-6, usually imbricate alternate with sepals. Disk annular, often lobed. Stamens 4-10 inserted under (rarely on) the disk. Ovary superior or half-inferior, 1-6 celled with solitary ovules. Fruit a drupe (dry in *Gluta*).

A large and important Order represented by about 16 trees wild or naturalised in our forests. The juice of many of them is black and is often acrid and blistering. The timber of the majority of the species is loose-grained and worthless, but in a few cases it is good. Perhaps the most important tree of this Order, not found with us, is *Rhus vernicifera* the Japanese "lacquer" tree which yields the famous lacquer so extensively used for coating articles of furniture and table ornaments. Some species of *Rhus* yield dyewoods and tanning materials.

Leaves simple.
  Ovary superior.
    Stamens as many as petals, only one fertile . 1. *Mangifera.*
    Stamens as many as petals, all fertile.
      Flowers bisexual. Style 1. Fruit-stalk not enlarged . 2. *Gluta.*
      Flowers polygamous. Style 1. Fruit-stalk not enlarged . 3. *Nothopegia.*
      Flowers diœcious. Style 3. Fruit on a fleshy hypocarp . 4. *Semecarpus.*
    Stamens double the number of petals, all fertile (except sometimes in *Anacardium*)
      Flowers polygamous. Fruit on a fleshy hypocarp . 5. *Anacardium.*
      Flowers bisexual. Fruit-stalk not enlarged . 6. *Buchanania.*
  Ovary inferior.
      Flowers dioecious. Petioles spurred . 7. *Holigarna.*
Leaves odd-pinnate.
  Ovary 1-celled.
    Flowers bisexual. Petals valvate. Style 1 . 8. *Solenocarpus*
    Flowers dioecious. Petals imbricate. Style 3 . 9. *Odina.*
  Ovary 2-6-celled.
    Flowers polygamous. Petals valvate. Styles 4-5 . 10. *Spondias.*

1 MANGIFERA Linn

Trees with simple, entire leaves, and regular, polygamous flowers in terminal, erect panicles. Calyx 4-5 fid, imbricate. Petals 4 5, imbricate Stamens 4-5, but only one fertile and much larger than the others, inserted within the disk. Style filiform. Ovary 1-celled, sessile, oblique. Drupe large, fleshy.

M. indica, Linn. Fl Br. Ind. ii, 13 Bedd. Fl Syl t. 162. 179
Trimen Fl Cey. i 317. Gamble Man. Tim. 211. Brandis Ind. Tr. 206. Eng. *Mango tree.* Tam. and Mal. *Mávu.*

Leaves 6-14 in. by 1-3 in lanceolate, acute, shining- purple or yellow when young, dark green when mature. Petible 1-4 in. Flowers pale yellow, strongly scented, male and bisexual on the same panicle. Drupe 2-6 in. long, compressed, ovoid, reddish-yellow, containing one flat seed.

A very large evergreen tree common in all our moist forests, from sea-level to 4000 ft It is also largely cultivated for its fruit througout the plains of Travancore. Height 100 ft Diam 3 ft Wild in Burmah, Sikkim Malabar and elsewbere in India, but not in Ceylon, cultivated everywhere.

Flowers Jan.-March. Fruits April-June.

Bark rough, greyish-black and 1 in. thick. Wood reddish-grey, coarse-grained and soft in younger trees, readily eaten by insects, dark brown in older trees and somewhat harder. Pores medium sized to large, often divided, scanty. Rays fine, wavy and close together.

W.=42 lbs. P.=514.

The wood varies greatly. My first experiment gave P=399, but better seasoned wood broke at 514, and I daresay that picked heartwood might give P—650.

The Mango tree is grown chiefly for the sake of its fruit which is, next to the plantain, the most important of the fruits of India. The fruit of the wild tree, though sweet, is stringy and full of turpentine. It is eaten by the Hillmen and by the poorer classes, and is a favourite food of bears. The fruit of good graft-trees is luscious and has none of the stringiness or turpentine flavour of the wild trees. Although the tree is so common in a wild state in our forests, the climate is too damp for the better kinds of Mango to bear regular, heavy crops, except in the drier parts of South Travancore. In other parts of the State a good season occurs only about once in five years, when the blossom happens to have opened earlier, and the monsoon is later than usual. The variety which bears best with us has a long, flat, slightly acid and very juicy fruit, but it does not bear comparison with the best varieties from Salem or Bombay. As pointed out by Brandis and others the seeds of good graft mangoes often produce trees which yield good fruit though they have not been grafted.

Besides being eaten raw, the fruit of the Mango tree is made into confections and pickles. The kernel, leaves, flowers, bark and gum are used in native medicine. (Pharm Ind. ii. 381). The timber is very largely used for rough-planking doors and window-frames, and is sometimes employed for tea-chests. but its weight is against its general use. Small canoes hollowed out of Mango trees are used in large numbers on the rivers and backwaters of Travancore.

The tree grows slowly at first, but when it has established itself the growth is faster. It appears to thrive on almost any soil. The seeds germinate in from 10-15 days and they should be sown fresh, or their vitality is lost. In the case of avenues or topes where it is desired that the trees should grow tall, the seeds should be put in at stake, as transplanting tends to produce bushy trees owing to the difficulty of moving the plants without injury to the long tap-root.

The present value of Mango wood in planks is 5-6 annas per c. ft. The quantity used every year in Travancore is very large, the supply coming from private lands in the low country.

2. GLUTA, Linn.

Trees with black, acrid juice and simple, entire leaves. Flowers bisexual in axillary and terminal panicles. Calyx spathaceous, opening irregularly. Petals 4-6, imbricate. Stamens 4-6. Style lateral, filiform. Ovary stipitate, oblique, superior, 1-celled. Fruit dry.

180 **G. travancorica.** Bedd. Fl. Br. Ind. ii. 22. Bedd. Fl. Syl. t 60. Gamble Man. Tim. 215. Brandis Ind. Tr. 207. Eng. *The Red-wood tree.* Tam. *Shenkuranthi.* Mal. *Thodappei.*

Leaves 3-6 in. by 1-2 in. spathulate, coriaceous, thick, subsessile, with strongly marked veins, crowded at the ends of the branches. Flowers cream-colourned, $\frac{1}{3}$ in. across Fruit depressed-globose. brown with a tough. rough shell $1\frac{1}{2}$ in. diam.

A very large tree confined to the evergreen forests of Travancore and Tinnevelly south of the road from Quilon to Shencottah. Between 500 ft. and 3500 ft. it is fairly common, especially about Rockwood Estate. It attains a height of 120 ft. and a diameter of 5 ft.

Flowers in March. Fruits June—Sep.

Bark smooth. pinkish-grey, $\frac{1}{3}$ in. thick. Sapwood white ; heartwood bright red, very hard and close-grained, beautifully streaked with dark and pale crimson. Pores few, medium-sized and full of resin. Rays very fine very numerous and prominent, crossed by numerous undulating, concentric lines. Annual rings 10-12 per inch.

W.—53 lbs P.—734.

This handsome wood is very little used because it is generally found in places difficult of access, but, if it were more abundant and were more generally known, it would be largely employed for furniture and inlaying. As Gamble says "It seems to season very well, "and works and polishes admirably, and is, distinctly one of the "finest and most beautiful woods of India." He recommends its being specially provided for in Working Plans and perhaps planted.

3. NOTHOPEGIA, Blume.

Trees with simple, entire leaves and small, polygamous flowers in axillary racemes. Calyx 4-lobed, persistent. Petals 4 imbricate. Stamens 4, inserted on the 4-lobed dish. Style 1, very short. Fruit a drupe, superior, depressed-globose.

N. Colebrookiana, Blume Fl. Br. Ind. ii. 40. Bedd. Fl. Syl. t. 164. Trimen Fl. Cey. i. 325. Gamble Man. Tim. 222. Brandis Ind. Tr. 207. 181

Leaves 2-6 in. by 1-2 in. lanceolate, narrowed to base, glabrous and shining above, paler beneath: nerves about 15 pair. Petiole about ½ in. Flowers greenish-white, ¼ in. across. Drupe bright red, 1 in. diam. edible.

An evergreen tree 40 ft. high and 1 ft. diam. with dark foliage and black, acrid juice, occuring in our evergreen forests between 1000 and 5000 ft. common on the Cardamom Hills and Peermeed, also seen at Ariankavu.

Flowers in Jan. Fruits June—July.

Gamble says that the bark is thin and brown. "Wood pinkish-"yellow, with a satiny lustre, hard close-grained. Pores small "scanty, evenly distributed, joined by narrow, wavy, pale, concentric" "lines. Rays fine, pale and numerous," and he gives

W = 62 lbs.

"The wood is strong, but scarce and not used." (Gamble). "The sweet oily pulp of the fruit is eaten" (Dict. Econ. Prod),

4. SEMECARPUS, Linn.

Trees with black juice, and simple entire leaves crowded at the ends of the branches. Flowers small, dioecious usually in terminal panicles. Calyx 3-5-lobed, lobes deciduous. Petals 5, imbricate. Disk broad, faintly lobed. Stamens 5, inserted outside the disk. Ovary 1-celled with 3 styles. Fruit n oblique. superior drupe, filled with an acrid resin and seated on a fleshy receptacle.

Leaves and panicles pubescent .. .. 1. *S. Anacardium.*
Leaves and panicles glabrous.
 Leaves very large, exceeding 10 in. long .. 2. *S. travancorica.*
 Leaves smaller, less than 7 in. long .. 3. *S. auriculata.*

1. **S. Anacardium**, Linn. Fl. Br. Ind. ii 30. Bedd. Fl. Syl. t. 166. Gamble Man. Tim. 220. Brandis Ind. Tr. 207. Eng. *The marking nut tree* Tam. *Shénkottei* : *shérankottei* : *thembárei.* Mal. *Thénkotta* : *sámbiri.* 182

Leaves 6-20 in. by 4-12 in. oblong-obovate, rounded at the top, very coriaceous. Petiole thick, 1-2 in. Branchlets, leaves and inflorescence covered with tomentum. Flowers in erect panicles, greenish-yellow, subsessible. ⅓ in. across. Drupe 1 in long, purplish-black, shining full of black juice, seated on an orange hypocarp. which is sometimes eaten.

A tree of moderate size up to 40 ft. high and 1½ ft. diam. growing in deciduous forests and fairly abundant from 0-1500 ft.

through Travancore, commoner in the South. Outside our limits it occurs through India, and in Northern Australia, but not in Ceylon.

Bare of leaves from Feb.—April. Flowers June—July. Fruits in November.

Bark brown, ¼ in. thick. Wood pale brownish-grey, coarse, moderately hard, without heartwood Pores evenly distributed, well marked on a longitudinal section, of medium size, scanty. Rays numerous, rather fine and close. No annual rings.

W = 35 lbs. P = 230.

The wood is of no use. The fruit is commonly used for marking cloths, and is sold in the bazaars as a dry black drupe of the size and shape of a broad bean, containing a brown. oily juice. For use as ink the juice should be mixed with lime-water The nut is employed in various ways by native physicians (Pharm Ind ii 389).

183 2 S. **travancorica**, Bedd. Fl. Br. Ind. ii. 31. Bedd. Fl. Syl. t 232 Gamble Man. Tim 221. Brandis Ind. Tr. 208. Tam. *Káttu shenkottei*: *punna chárei*. Mal. *Avukaram*.

Leaves 12-20 in. by 5-6 in. oblong-obovate, shining and reticulate, tip rounded nerves prominent beneath, 16-18 pairs. Petiole 2 in Flowers 1/5 in across, greenish-yellow, in axillary and terminal panicles as long as leaves. Drupe obliquely oblong. 1½ in. long, on a thickened peduncle.

A very large tree of handsome appearance, common in the evergreen forests of Travancore and Tinnevelly between 1000 and 4000 ft. Height 100 ft. Diam. 3 ft.

Flowers Sep.—Nov. Fruits May—July.

Bark grey, blotched with black, Wood course, greyish-white, soft Pores few, medium sized to large. Rays moderately broad, short, crossed by fine bands of white tissue. No annual rings.

W = 28 lbs. P. = 425.

The wood is useless. The fruit may be used in the same way as the marking-nut.

184 3. S **auriculata**, Bedd Fl. Br. Ind. ii 32. Bedd. Fl. Syl. t. 232 Gamble Man. Tim 221 Brandis Ind. Trees 208. Tam. *Vellei charei*; *man charei*. Mal. *Cearei*.

Leaves 3-7 in by ¾-1½ in very glabrous, oblanceolate, tapering to base, with 2 rounded auricles just above the petiole, which is ¼ in. long Flowers in copious, axillary panicles, yellow, male 1/6 in. across, female larger Drupe ¾ in long by ½ in broad full of black juice, very oblique, with a thickened peduncle.

A large and handsome tree common in the evergreen forests of Travancore and Tinnevelly from 0-3000 ft. Height 80 ft. Diam. 2 ft.

Flowers Oct.—Jan. Fruits March—May.

Bark grey, smooth, ¼ in. thick. Wood greyish-white, very coarse and open grained, soft and rough. Pores large, scanty, often subdivided, prominent on a radial section. Rays fine and close together No annual rings.

W = 28 lbs. P = 404.

The wood is useless.

5. ANA ARDIUM. Rottb.

Trees with simple, entire leaves, and regular, polygamous flowers in terminal panicles. Calyx 5 fid, erect. Petals 5, imbricate recurved. isk erect. Stamens 10, sometimes only one fertile, Ovary superior. Style filiform. Drupe kidney shaped, seated on a pear-shaped, fleshy peduncle.

A. occidentale, Linn. Fl. Br. Ind ii 20. Bedd Fl. Syl t 163. Gamble Man. Tim. 214. Brandis Ind. Trees 204. Eng *The Cashew nut tree.* Tam *Munthiri kottei.* Mal *Larangimávu.* 185

Leaves 4-8 in by 2 5 in obovate, leathery, pale green, glabrous' with about 13 pairs of strong nerves Petiole $\frac{1}{2}$ in Flowers $\frac{1}{3}$ in, across, yellow streaked with pink, in panicles 6 10 in long Drupe 1 in long, greenish gray, peduncle 2-3 in long, yellow or scarlet

A much-branched tree, native of America, introduced by the Portuguese about A. D. 1550, and established in the low country of Travancore, where it is found in waste places, especially near the sea coast, often thriving on very poor soil Planted for its fruit Height 0 ft Diam 1 ft. Naturalised in Southern India, especially the Western Coast, and in Ceylon, but apparently absent from Northern India and Bengal.

Flowers Dec—April. Fruits March—June.

Bark rough, $\frac{1}{4}$ in. thick. Wood pale grey, coarse and rather soft. No heartwood. Pores large, scanty, filled with a pithy substance, prominent on a vertical section. Rays extremely fine and close together. Annual ring marked by darker lines 4 to inch. (Gamble gives 8 to 11 rings per inch).

W=30 lbs. P=317.

Gamble considers that this weight is too low and gives 36 lbs. as an average, and he says that the wood is used in Ceylon and Burmah for packing-cases, boat-building and charcoal. Slower-grown wood is very likely heavier and more durable than ours. I have never heard that the wood was of any use except for fire wood and charcoal and even for these purposes it cannot be said to be good.

"The principal products are, a spirit distilled from the fermented" "juice of the torus, the kernals of the nuts, and a tar obtained by" "roasting the pericarp of the fruit." The spirit is drunk, the kernels are roasted or eatern raw, and the tar is used for tarring boats and wood-work and is recommended as an external application for leprosy ring-worm and ulcers. Other products of this tree are used medicinally both in Europe and India. (Pharm. Ind. ii. 386.)

6. BUCHANANIA. Roxb.

Trees with simple, entire leaves, bisexual flowers in terminal and axillary panicles Calyx 3 5-fid, persistent. Petals 4-5 imbricate, oblong, recurved Disk lobed. Stamens 8-10, free, inserted,

outside the Disk. Style terminal, short. Ovary superior. Drupe bony, 2- valved.

Panicles tomtntose. Peiolcs stout.
Leaves exceeding 6 in. long, hairy beneath, oblong, nerves stout . 1. *B. latifolia.*
Leaves less than 6 in. long, glabrous beneath, lanceolate, nerves slender . 2. *B. lanceolata.*
Panicles glabrous. Petioles slender . 3. *B. angustifolia.*

186 **B. latifolia**, Roxb. Fl. Br. Ind. ii. 23. Bedd. Fl. Syl. t. 165. Gamble Man. Tim. 216. Brandis Ind. Tr. 205. Tam. *Morala: moda maru* Mal *Munga pera : mora : nuruvei.*

Leaves 6-10 in. by 2-3 in. oblong. obtuse at both ends, coriaceous, villous. nerves straight and stout, 15-20 pairs. Petiole ½in. Flowers greenish-white, sessile, ½ in. across in dense panicles. Drupe compressed laterally, ½ in, long black.

A medium sized tree up to 60 ft. high and 1 ft. diam, very common in all our deciduous forests from 0-4000 ft. Occurs throughout India and Burmah, but not in Ceylon.

Flowers Jan—March. Fruits April—May.

Bark black, very rough, covered with round bosses, ½ in. thick Wood pale greyish-brown. moderately hard. with a small dark-coloured heart Pores large or medium-sized, often divided, scanty, prominent on a vertical section. Rays very numerous and fine. Annual rings marked by dark lines about 10 to inch

W=36lbs: P=452.

In Travancore the wood is not used except for firewood and charcoal and no use seems to be made of the fruit. But Brandis says that in Northern India the wood is converted into boxes, bullock-yokes and door-and window-frames, and that the bark is used for tanning. Throughout India the seeds are collected, the kernels being extensively eaten raw and in the form of sweetmeats. They are an important article of trade. An oil is extracted from them (Brandis).

187 2. **B. lanceolata,** Wight. Fl. Br. Ind. ii. 24, Gamble Man Tim. 216. Brandis Ind. Tr. 205. Mal. *Mala mavu.*

Leaves 4-6 by 1½-2 in. elliptic-lanceolate, coriaceous, shining on both surfaces. nerves thin, arched, 15-20 pairs. Petiole ¾ in. Flowers in stout. pubescent panicles. shorter than leaves, each ⅛ in. across, dirty white. Drupe compressed laterally, ¾ in. long. red.

A tree of medium size observed by Wight "near Quilon" and found by me in fair abundance in the evergreen forests near Kulathupuzha up to 2000 ft. elevation. Endemic. Height 60 ft. Diam. 1½ ft.

Flowers Oct.-Nov. Fruits May-June.

The timber of this tree has not been examined. The Kernels of the seed are eaten by the Hillmen.

188 3. **B. angustifolia**, Roxb. Fl. Br. Ind. ii. 23. Bedd. Fl. Syl. lxxix. Trimen Fl. Cey. i. 386. Gamble Man. Tim. 217. Brandis Ind. Tr. 205.

Leaves 4-6 in. by $1\frac{1}{2}$-2 in lanceolate, obtuse. glabrous on both sides, nerves thin, 12-15 pairs. Petiole slender, about 1 in. Flowers dull white, $\frac{1}{6}$ in. across, in glabrous panicles shorter than the leaves. Drupe $\frac{1}{2}$ in. diam. compressed laterally.

A tree of medium size, observed by Beddome and Lawson in the dry forests of South Travancore, not by me. Found in the drier forests of Southern India and Ceylon.

Flowers in April.

Gamble says that the "bark is black-brown, $\frac{1}{2}$ to $\frac{3}{4}$ in. thick," "rough. Wood greyish-brown, moderately hard. Pores large, scanty," "sometimes subdivided. Rays very numerous" and he gives

W=43 lbs.

"The wood is not used. The nuts are eaten in the same way" "as those of *B. latifolia*. to which they are superior. They are "usually eaten roasted" (Gamble).

7. HOLIGARNA, Ham.

Trees with simple, entire leaves, the petiole furnished with 2-4 spur-like appendages. Flowers small, dioecious in axillary or terminal panicles. Calyx 5-fid, cupshaped. Petals 5, villous within persistent, valvate. Disk lining the calyx-tube. Stamens 5, inserted on edge of disk. Ovary inferior, 1-celled. Styles 3-5. Drupe ovoid, with an acrid juice.

Leaves glabrous beneath, not exceeding 10 in.
- Leaves 4-10 in. nerves 10-20 pairs Flowers rusty —1. *H. Arnottiana*
- Leaves not exceeding 6 in. nerves 6-9 pairs. Flowers sooty—2. *H nigra*.

Leaves pubescent beneath, exceeding 10 in. —3. *H. Beddomei*

1. **H. Arnottiana,** Hook. f. Fl. Br. Ind. ii. 36. Bedd. Fl. Syl. 189
t. 167 (under *H. longifolia*). Gamble Man. Tim. 221. Brandis Ind. Tr. 203. Tam. *Karun chárei*. Mal. *Chéra*.

Leaves 4-10 in. by 1-3 in. cuneate, decurrent on the petiole, coriaceous, shining, clustered at ends of the branches. nerves 10-20 pairs. Petiole about $\frac{3}{4}$ in. Flowers 1/10 in. across, covered with rusty tomentum within and without. Drupe obiquely, ovoid, glabrous, 1 in. long.

One of our commonest low country trees, and generally to be found on canal and river-banks, attaining a height of 60 ft. and $1\frac{1}{2}$ ft. diam. A black caustic juice exudes from all parts of the tree. Found also on the Western Ghauts and the Neilgherries. Absent from Ceylon.

Flowers Jan-Feb. Fruit June-July

NOTE.—According to the Flora of British India another species *H. ferruginea*, March differing from *H Arnottiana* by having stouter racemes and larger flowers, is said to occur in Travancore. I have searched high and low for it, but have never seen it. At the same time it must be said that the racemes of *H. Arnottiana* vary in length and stoutness, and that its flowers are larger or smaller within certain limits.

Bark rough, $\frac{1}{3}$ in. thick. Wood greyish-white, darkening with exposure, soft, coarse and open-grained : no heartwood. Pores large, scanty, often subdivided. Rays fine, white, visible on a longitudinal section. Annual rings not visible.

W = 27 lbs. P = 343.

In Travancore no use is made of the tree, and its wood is bad and decays rapidly. Beddome says he understands that the wood is sometimes used for house building and to make boats, but this must be a mistake. Flying foxes and porcupines are very fond of the fruit. and the Hillmen have told me that they bait traps for these animals with it.

Hooper (Ind For. xxi. 478) says that the tree is called the "Black varnish" tree in Malabar, and that the juice is used for "waterproof-"ing boats, furniture and houses, and for indelibly fixing black-" "figured patterns on linen and cotton cloths." The juice is very blistering. He found that the vesicating principle of the fruit was contained in the pericarp. The juice of the Japanese lacquer tree has much the same properties, and it is possible that an industry might spring up in Travancore if the juice of our tree was employed in the same way.

190 2. **H. nigra** Bourdillon. Ind. For. xxx. 95. Gamble Man. Tim. 222. Brandis Ind. Tr. 263. Mal. *Chéri.*

Leaves 3-6 in. by 1-2$\frac{1}{2}$ in. simple, entire, spathulate, dark green, very coriaceous, nerves 6-9 pairs Petiole about 1 in. Male panicles up to 12 in. long female 3 in Flowers $\frac{1}{6}$ in. across, white within, black without, Drupe not seen.

A large tree occurring in the evergreen forests of Travancore between 2,000 and 4,000 ft. attaining a height of 100 ft., and diameter of 2 ft. Endemic.

Flowers April—May.

Bark smooth, grey, $\frac{1}{4}$ in. thick. Wood soft, coarse and open-grained, greyish-white, no heartwood. Pores large, scanty, Rays fine, reddish-white, giving a pretty silver-grain. Annual rings not seen.

W. = 31 lbs. P. = 418.

191 The wood is bad. A black juice exudes from the tree as in *H. Arnottiana.*

3. **H. Beddomei.** Hook. f. Fl. Br. Ind. ii. 38. Gamble Man. Tim. 222. Brandis Ind. Tr. 203. Tam. *Pál vidinyán.*

Leaves 10-22 in. by 4-8 in. simple, entire, cuneate-oblanceolate, densely villous beneath, nerves 20-30 pairs. Petiole 1$\frac{1}{2}$ in. Flowers and fruit are not seen.

A lofty tree 80 ft. high and 2 ft. diam. found by Beddome on the Anamallais and seen by me in the evergreen forests near Puliyara at 1,000 ft. Not recorded from elsewhere.

Bark smooth, $\frac{1}{6}$ in. thick. Wood light grey, soft and coarse : no heartwood. Pores large, scanty, often subdivided, prominent as brown lines on a vertical section. Rays rather broad, brown. Annual rings not seen.

W.=31 lbs. P.=308.

The wood is soft and perishable, and the juice is black.

8. **SOLENOCARPUS.** Wt. and Arn.

Trees with odd-pinnate leaves, and bisexual flowers in terminal panicles. Calyx small, 5-toothed. Petals 5, ovate, valvate. Disk broad, lobed. Stamens 10, inserted at base of disk Ovary 1 celled containing 1 pendulous ovule. Style 1. Fruit a bony drupe.

S. indica Wt. and Arn. Fl. Br. Ind. ii. 27. Bedd. Fl. Syl. t. 233, Gamble Man. Tim. 218. Brandis Ind. Tr. 200.

Leaves 6-12 in long of $4\frac{1}{2}$-$7\frac{1}{2}$ pairs of opposite, crenulate leaflets, 192
lanceolate-accuminate, each 2 3 in. by $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers white, $\frac{1}{6}$ in. across. numerous. Drupe ovoid, $\frac{1}{4}$ in. long, pericarp full of oil, stone hard.

A little known tree of large size found by me in the evergreen forests of Southern Travancore at 2,5 0 ft elevation, and recorded, from the Anamallais and Western Ghauts. Not in Ceylon.

Bare of leaves in March when the flowers appear Fruits March., April.

The timber is unknown.

9. **ODINA,** Roxb.

Trees with odd-pinnate leaves. clustered at the ends of the branches and unisexual flowers in racemes. Calyx 4-5 lobed. persistent, Petals 4-5 imbricate. Disk lobed. Stamens 8-10, inserted outside the disk, ovary sessile, 1-celled, Styles 3-4, stout. Fruit a drupe with a hard stone.

O, Wodier, Roxb. Fl. Br. Ind. ii, 29, Bedd. Fl. Syl. t. 123, 193
Trimen Fl. Ceyl. 318. Gamble Man. Tim. 218, Brandis Ind. Trees 200, Tam. *Uthi: urisa, Kalasan.*

Leaves 12-18 in. long of $3\frac{1}{2}$-$4\frac{1}{2}$ pairs of opposite leaflets. each 3-6 in. by $1\frac{1}{2}$-2 in, entire, oblong-acuminate, Male flowers in compound racemes up to 12 in. long. Female in simple racemes 3 in. long, generally on different trees, each flower $\frac{1}{3}$ in. across, yellow. Drupe red, shining, ovoid, $\frac{1}{2}$ in. long.

A large tree of fast growth up to 80 ft. high and $2\frac{1}{2}$ ft. diam very common in the grass forests of the low country, ascending the hills to 1,000 ft. often planted along road-sides as an avenue tree, but useless for this purpose being bare of leaves in the dry weather. Common throughout India, Assam, Burmah and Ceylon and often planted.

Without leaves from Jan—March. Flowers January—April. Fruits May—June.

Bark brown, smooth. $\frac{1}{2}$ in. thick, often flaking off. Sapwood white turning to grey, 3 in. thick. Heartwood bright pinkish brown, close-grained, smooth, moderately hard. Pores of medium size, evenly distributed. scanty, often divided. Rays fine and numerous. Annual rings not visible.

W.=60 lbs. P.=673.

With us the wood is sometimes used for furniture but it is not durable. Elsewhere it is converted into spear-shafts, scabbards, wheel-spokes, cattle-yokes. oil presses and rice-pounders. If the heartwood were larger it would probably come into more general use Gamble says that "the tree is pollarded for fodder, especially for elephants ; its bark is used for tanning ; it gives a brown, clear brittle gum, used by the Nepalese as paper-sizing, by weavers in cloth-printing, and in native medicine." And he says that it has been valued at 20 sh. to 25 sh. per cwt. The bark is very astringent, and is used for various purposes by native physicians. (Pharm. Ind ii. 393).

10. SPONDIAS, Linn.

Trees with odd-pinnate leaves, generally crowded at the ends of the branches, and polygamous flowers in terminal, spreading panicles. Calyx 4-5 fid deciduous. Petals 4-5. spreading, valvate. Stamens 8-10, inserted outside the large disk. Ovary sessile, 4-5-celled, styles 5. Drupe ovoid, stone very hard.

194 **S. mangifera**, Willd. Fl. Br. Ind. ii. 42. Bedd. Fl Syl. t 169. Trimen Fl Cey. i. 327. Gamble Man. Tim. 223. Brandis Ind Trees 201. Eng. *The Hog plum.* Tam *Mam pulicchi* Mal *Ambalam.*

Leaves 1-1½ ft long of 4½-6½ pairs of caudate-acuminate, entire leaflets, with a strong intra-marginal vein, each 2-6 in by 1-3 in. red when young, pale green when old. Flowers ¼ in. across, greenish-white. Panicles 1-2 ft long. Drupe yellow, smooth, 1½-2 in long, containing 1-3 seeds.

A large tree widely scattered through Travancore, occurring in the deciduous forests from 0-2000 ft and attaining a height of 80 ft and a diameter of 2½ ft Often cultivated. Found throughout India. Burmah and Ceylon, and in China. Growth fast.

Bare of leaves during the hot weather. Flowers in Dec.—April. Fruits July-Nov.

Bark smooth, greyish-white, ⅜ in. thick. Wood greyish-white, extremely soft and soon perishable Pores large, numerous, often divided Rays fine, white at unequal distances, distinctly marked as long narrow plates in the silver-grain. Annual rings not seen.

W = 22 lbs. P = 293.

The wood of the tree is quite useless. "Its fruit is much used" "by the Hindus as an acid vegetable, and they make a preparation" "of it resembling gooseberry fool, which is called Rayete. The" "leaves and bark are astringent and aromatic. (Pharm. Ind ii. "395)."

"It gives an insipid gum somewhat resembling gum arabic, but darker." (Gamble).

A small tree *Moringa pterygosperma, Gaertn.* Eng. *The Horse radish or Drumstick tree* Tam *Muringa* may here be mentioned, as it is generally placed before Connaraceæ. It is largely grown for its fruit which is much eaten as a vegetable. The root has a strong taste of horse-radish. An excellent oil, known as the "oil of Ben," used

by watch-makers is obtained from the seeds, and the gum and leaves are used in native medicine. It is indigenous in Northern India, and is often seen growing wild in the neighbourhood of cultivation.

CALYCIFLORÆ.

ORDER XXXII. CONNARACEÆ.

Trees with alternate unifoliolate, entire leaves, stipules none. Flowers regular, bisexual, in axillary racemes Calyx 4-5 lobed, valvate. Petals 4-5, pubescent, spreading Stamens 4-5, alternating with 4-5 shorter staminodes, often connate at base Carpel solitary, with 2 ovules. Fruit a follicle. Seed solitary, erect, with a large, pulpy aril.

An order containing many climbers but only one small tree found in Travancore.

ELLIPANTHUS, Hook f.

Characters of the Order.

E. Thwaitesii, Hook f. Fl Br. Ind. ii. 55 Bedd. Fl. Syl 195
t. 170 Trimen Fl. Cey ii. 3 Gamble Man. Tim. 227. Brandis Ind. Trees 213. Mal. *Padappan.*

Leaves 2-5 in. by 1-1$\frac{1}{2}$ in. elliptic-lanceolate, acuminate, glabrous above, tomentose beneath. Petiole $\frac{1}{2}$ in. Flowers in short axillary fascicles, greenish-white, each $\frac{1}{4}$ in. across. Follicle 1-1$\frac{1}{2}$ in. long, velvety-brown much curved when young, at length nearly straight, pointed, containing one blue-black seed $\frac{3}{4}$ in. long, half covered by the pink aril.

A small tree occurring in the evergreen forests near Kulathupuzha and in the Shendroni valley between 0-2000 ft. Height 30 ft. Diam 6 in. Also found in Tinnevelly and Ceylon.

Flowers Feb.—March. Fruits may—June.

The timber is unknown.

ORDER XXXIII—LEGUMINOSÆ.

Trees with alternate, stipulate, generally compound leaves; leaflets entire. Flowers usually bisexual and bractate, regular or irregular. Inflorescence generally racemose or panicled. Calyx more or less deeply cut into 5 segments. Petals usually 5. Stamens 10 or fewer, or numerous, generally inserted inside the calyx-tube, filaments free or combined. Ovary free, stile symple. Ovules numerous or few. Fruit a pod, separating into two valves or indehiscent.

A large Order of very great importance to the Forest Officer in all parts of India as it contains very many of the most valuable timber trees. To it belong also many food-grains and pulses, while gums, tanning materials and other products, obtained from trees and plants of the Order, are used in the Arts and Industries. In Travancore about 45 leguminous trees are wild in our forests.

This Order is generally divided into three well-marked Sub-Orders. (See Brandis Indian Trees 14.)

Calyx gamosepalous, often 2-lipped; petals free, very unequal, imbricate, the posterior outside; stamens generally diadelphous . . .	1. *Papilionaceæ.*
Calyx divided nearly to the base petals free, slightly unequal, imbricate, the posterior inside; stamens free . . .	2. *Caesalpineæ.*
Calyx gamosepalous: petals more or less connate, equal, valvate; stamens free or monadelphous .	3. *Mimoseæ.*

SUB-ORDER I—PAPILIONACEÆ.

Leaves trifoliolate

Petals unequal. Stamens monadelphous. Pods 2-10-seeded	1. *Erythrina.*
Petals subequal. Stamens diadelphous. Pods 1-seeded	2. *Butea.*

Leaves odd-pinnate.

Stamens monadelphous (sometimes diadelphous)	
Pod dehiscent . . .	3. *Mündulea.*
Pod indehiscent.	
Leaflets alternate.	
Flowers white or purple. Pod oblong .	4. *Dalbergia.*
Flowers yellow. Pod round . .	5. *Pterocarpus.*
Leaflets opposite . . .	6. *Pongamia.*
Stamens free. Pod dehiscent . .	7. *Ormosia.*

1. ERYTHRINA, Linn.

Trees often prickly, with trifoliolate leaves and large coral-red flowers in axillary and terminal racemes. Calyx spathaceous. Petals very unequal, standard much larger than wings or keel. Stamens 10, monadelphous, the upper free nearly to the base. Pod torulose, 2-10-seeded.

196 **E, stricta**, Roxb. Fl. Br. Ind. ii. 189. Bedd. Fl. Syl, t 175. Gamble Man. Tim 242. Brandis Ind. Tr. 227. Eng. *The Indian Coral tree.* Tam. and Mal. *Murukku.*

Trunk and branches armed with sharp, conical, white prickles. Leaf-rachis about 4 in long, leaflets glabrous, ovate 2-5 in, by $1\frac{1}{2}$-4 in. terminal largest. Racemes terminal, horizontal, about 5 in. long. Flowers 2 in long and $\frac{3}{4}$ in. across. Pod lanceolate, glabrous 2-4 in. long, containing 1 3 seeds.

A tree of medium size and very sparse foliage, common in all the deciduous forests from 0-4000 ft. Height 50 ft. Diam. $1\frac{1}{2}$ ft. Occurs also in Assam, Bengal, Burmah and the Western Coast of India, but not in Ceylon.

Bare of leaves during the dry weather. Flowers January-April. Fruits July-August.

Bark corky, thick, greenish-grey. Wood white, very soft and spongy but tough, darker in the centre. Pores very large, very scanty, often divided. Rays short, broad. Gamble gives.

W=16 lbs.

In Travancore the wood is only used for floats for fishing-nets. It is one of our lightest woods. Gamble says that "though so light" "and soft it is fairly durable, and is in constant demand for various" "purposes, such as scabbards, sieve-frames, planking and special" for jars for household purposes, and boxes to be covered with "lacquer" It lasts well if painted. Flowers and bark used for dyeing and the latter for tanning. Bark, leaves and juice used medicinally. (Dict. Econ. Prod.)

Two trees of genus *E indica* and *E lithosperma* are very commonly planted the former, a native of other parts of India, in gardens in the low country as a support for pepper-vines, and the latter from the Malay Archipelogo on hill estates as shade for coffee or tea.

2. BUTEA Roxb.

Trees with trifoliolate leaves and large stipules. Flowers densely fascicled in axillary and terminal racemes with linear bracts. Calyx campanulate Petals nearly equal. Stamens 10, diadelphous. Ovary 2-ovuled. Pod oblong 1-seeded thin.

B frondosa, Roxb. Fl. Br. Ind. ii. 194. Bedd. Fl. Syl. t 176. 197
Trimen Fl Cey. ii. 66 Gamble Man Tim. 243. Brandis Ind. Tr. 230. Tam. *Purasu* Mal. *Pal ísin samatha*: *púpal ísu*.

Leaf-rachis 5-8 in. long, leaflets ovate, terminal largest. 4-8 in. long and broad, lateral leaflets oblique, glabrous above, silky below. Racemes 6 in long Flowers bright orange, 2 in long Pod 5 8 in. long by ¾ in broad. Seed oval, flat, brown, smooth. 1½ in long

A tree of medium size confined to the drier parts of the country, such as Puliyara and the Cardamom Hills where it is to be found growing in grass land up to 4000 ft When found elsewhere it is probably been introduced. It is wild throughout the plains of India, Burmah and Ceylon.

Bare of leaves in the hot season. Flowers Feb.—March. Fruits June—July.

Gamble says that the bark is ¼ in thick, grey. Wood grey or grey-brown, soft, not durable, No annual rings Pores large, very scanty, often divided. Rays broad and moderately broad. pale, and he gives

W=39 lbs. P=335.

"The wood is not durable above ground but is said to be much "better under water, and is consequently used in Upper India for" "well-curbs and piles, also for the water-scoops of native wells." (Gamble). If cut up green and seasoned in planks it does fairly well, but if left in logs it decays. The bark gives a coarse fibre, the leaves are used as plates and a ruby gum known as "Bengal kino" is obtained from cuts in the bark.

The seeds are anthelmintic and aperient, and are very useful for putting horses into condition: they have been employed successfully as a cure for dhoby's itch. The gum and flowers are used in native medicine, and from the latter a yellow dye is obtained. (Pharm. Ind. i. 454).

This tree is, next to *Schleichera trijuga*, the best for the production of lac, "the insect being readily propogated by tying small" pieces of the stick-lac off a bearing tree on a branch of the one on which it is intended to grow" (Gamble).

Closely allied to this tree is *Spatholobus Roxburghii*, Bth Tam. *pilacchi valli*, Mal. *Athambu* a gigantic climber which is very abundant in the deciduous forests throughout Travancore and is very destructive to teak and other trees by coiling round them and preventing their growth. Its purple flowers appear in August, and its brown winged fruit ripens in April—May. Its gum is ruby-coloured and transparent.

3. MUNDULEA, DC.

Small trees with odd-pinnate leaves and large flowers in terminal racemes. Calyx campanulate. Petals nearly equal, standard long-clawed. Stamens monadelphous, the 10th free at the base. Pod linear, contracted between the seeds, 2-8-seeded.

198 **M. suberosa**, Benth. Fl. Br. Ind. ii. 110. Bedd Fl. Syl. lxxxv. Trimen Fl. Cey. ii. 29. Gamble Tim. 233 Brandis Ind. Trees 219 Tam *Pil avaram*.

Leaf-rachis 4-6 in long of 13-23 ovate-lanceolate, apiculate leaflets $\frac{3}{4}$-$1\frac{1}{2}$ in by $\frac{1}{2}$-1 in glabrous and bright green above, silky beneath. Flowers purple, 1 in. long. Pod 2-4 in. straight, linear and densely velvety. Seeds $\frac{1}{8}$ in. yellowish-brown.

A small tree found by me on the dry slopes to the east of Mahendragiri at 1,300 ft elevation. Height 20 ft. Diam. 6 in. Occurs also in the drier parts of the Deccan, Southern India, and Ceylon and in Africa.

Flowers May—Aug. Fruits Oct — Nov.

Bark thick, corky, yellow brown. Wood yellow darkening to the centre, hard and close-grained. Pores scanty, fine, joined by concentric lines of light tissue. Rays fine, thin, clear, not numerous.

"A pretty little tree, worthy of garden cultivation, and likely to be useful in reafforesting bare hills." (Gamble).

Allied to the above is *Sesbania grandiflora*, Pers. Tam. *Agathi*. a pretty little tree with delicate foliage, large pink flowers and long thin pods. It is extensively planted as a support to the betel vine, especially in the drier parts of the country, and the tender leaves, pods and flowers are eaten as a vegetable. It is sometimes seen in uncultivated areas in Travancore. It is a native of the Indian Archipelago and N. Australia. Its wood is not durable. (Gamble).

4. DALBERGIA, Linn. f.

Trees with alternate, odd-pinnate leaves, and alternate leaflets without stipels. Flowers small in terminal or axillary panicles. Calyx campanulate, 5-dentate Corolla exserted, standard broad. wings oblong, keel-petals short, connate at the tip. Stamens 9 or 10, monadelphous or diadelphous. Style short. Ovary stipitate. Pod indehiscent, thin, seeds 1-4.

Stamense 9 united in a sheath. Timber purple.

Leaflets 3-7, dark green when young. Flowers axillary 1. *D. latifolia.*

Leaflets 7-10, pale green when young. Flowers terminal 2. *D. sissoides.*

Stamens 10 in 2 bundles of 5 each. Timber white.

Leaflets 10-17 glabrous. Flowers axillary .. 3. *D lanceolaria.*

Leaflets 9-13, pubescent on the mid-rib Flowers terminal .. *D. paniculata*

1. **D. latifolia**, Roxb. Fl. B. Ind ii. 231. Bedd. Fl. Syl. t. 24. Gamble Man. Tim. 250. Brandis Ind. Tr. 233. Eng. *Bombay Rosewood.* Tam. *Thothagatti.* Mal. *Eetti: vitti: káritti.* 199

Leaf-rachis 3-5 in. with 3-7 leaflets 1-2½ in. each way, dark green at all stages, glaucous beneath, orbicular, obtuse or emarginate, dull, distal largest, decreasing in size inwards. petiolules slight, very short Flowers white ¼ in. long, on short pedicels in axillary much branched panicles. Stamens 9 united in a sheath, split above. Pod oblong lanceolate 2-3 in. by ¾ in. tip rounded. Seeds reniform, brown.

A large and handsome deciduous tree with a spreading, crown, widely distributed through Travancore between sea-level and 4000 ft. though less common at the lower elevations and nowhere abundant; found in grass forest in company with teak, and sometimes in the drier parts associated with evergreen trees Height 80 ft. Diameter 4 ft Occurs also in Bengal, Central and Southern India and the Andamans, but absent from Burmah and Ceylon.

Flowers appear with the young leaves in Jan.—Feb. Fruits Nov.—Jan.

Bark ½ in thick, grey to rusty-brown Sapwood 2 in. thick, yellowish-white. Heartwood very hard, close grained dark purple with black or red longitudinal lines, some specimens showing a beautiful lake tint No distinct annual rings. Pores medium-sized to large, often divided, irregular. Rays fine, numerous, uniform and equidistant. Gamble gives.

W = 50 lbs. P. = 950.

This tree and the next are royalties. The timber of this tree is highly valued for furniture and it is very durable. It is exported to Bombay in some quantities. Its value is about Rs. 1-8 per cub. ft. on the coast in logs. It is esteemed for gun-carriages on account of its strength. It is also used for cart-wheels and tool-handles. This tree grows well from seed and also coppices well. It has a habit of sending up root-suckers in large quantities, many of which grow into trees. In this way old trees are often seen surrounded by a number of younger ones. The rate of growth is slow, 6-9 rings per inch of

radius. A tree 2 ft. in diam. would be about 100 years old. It is a good shade tree for coffee.

200 2. **D. sissoides**. Grah. Fl. Br. Ind. ii. 231. Bedd. Fl. Syl. t. 24 Gam. Man. Tim. 252. Brandis Ind. Tr. 233 (all under *D. latifolia*) Eng. *Malabar Blackwood*. Tam. *Thothagatti*, Mal. *Eetti : vitti : vell-itti*.

Leaf-rachis 5-6 in. with 7-10 leaflets, each $1\frac{1}{3}$-$2\frac{1}{2}$ in. by $\frac{3}{4}$-$1\frac{1}{4}$ in. oblong, generally tapering to both ends, all more or less equal in size, glabrous, pale green when young, dark green and shining when old, beneath glaucescent, petiolules stout, $\frac{1}{4}$-$\frac{1}{3}$ in. Flowers white, $\frac{1}{3}$ in. long in small terminal panicles about 12 together. Stamens 9, united in a sheath. Pod 2-3 in. by $\frac{1}{2}$ in., tapering to both ends, pointed. Seeds reniform, pale brown.

A handsome deciduous tree of a similar appearance, but with lighter and more shining foliage than the last, and not attaining the same size. Common through Travancore in grass forest up to 2000 ft. and commoner in the low country than *D. latifolia*. Height 60 ft. Diam. 2 ft. Found also in the Nilghiris and Palneys, but confined to Southern India.

Flowers appear with the fresh leaves in Jan.—Feb. Fruit ripens Oct.–Jan.

Bark pale brown, $\frac{3}{4}$ in. thick. Sapwood 2 in. thick, yellowish white. Heartwood purple or dark brown with darker longitudinal streaks of brown or purple, very hard, close-grained, but apt to be cross-grained. Pores medium-sized to large, irregular, often divided, joined by white concentric lines. Rays fine and uniform. Annual rings indistinct.

$$W = 52 \text{ lbs.} \quad P = 721.$$

The properties and uses are the same as the last named, but the timber is said to be stronger and harder and not so susceptible of a good polish. Its value is the same, but on account of the darker colour of that tree, most people prefer *D. latifolia*. About 20,000 cub. ft. of this tree and the last are felled each year.

It grows well from seed and coppices freely, but does not seem to propagate itself so well from root-suckers. The rate of growth seems to be much faster. Measurements of an old tree taken for several years show an increase in diameter of 1 in. per year, while a small tree planted 11 years ago is now 48 feet high, and its girth at $4\frac{1}{2}$ feet is $22\frac{1}{2}$ in. This would give a rate of growth of 3 rings per inch of radius.

201 3. **D. lanceolaria**, Linn. Fl. Br. Ind. ii. 235. Bedd. Fl. Syl. lxxxviii (under *D. frondosa*). Trimen Fl. Cey. ii. 88. Gamble Man. Tim. 253. Brandis Ind. Tr. 236. Tam. *Ergei*. Mal. *Pulari*.

This tree has until lately been considered as merely a variety of *D. latifolia* but it has been now proved to be a true species. The number, shape and texture of the leaflets, the position of the inflorescence, the shape of the pods, and the colour and characters of the timber differ.

Leaf-rachis 5-7 in. with 10-17 leaflets, 1 $1\frac{1}{2}$ in. by $\frac{3}{4}$-1 in. ovate-oblong. obtuse, glabrous above, glaucous beneath, petiolules $\frac{1}{4}$ in. stipules $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers $\frac{3}{8}$ in. long, deciduous. purplish-white, in short axillary panicles. standard broadly ovate. Stamens 10 in 2 bundles of 5. Pod $2\frac{1}{2}$ in. by $\frac{1}{2}$ in. straight, tapering to both ends, seeds reniform, compressed $\frac{1}{3}$ in. long.

A deciduous tree of medium-size found in all our grass forests at low elevations. Height 50 ft. Diameter $1\frac{1}{2}$ ft. Occurs also in Northern and Western India and in Ceylon.

Flowers appear with the young leaves in March. Fruit ripens from Oct.—Jan.

Bark grey, smooth, $\frac{1}{4}$ in. thick. Wood yellowish-white, moderately hard, no heartwood. Pores scanty, medium-sized to large, often divided or in strings. Rays very fine and numerous. Annual rings marked by thin concentric lines.

W=48 lbs. P=718.

The wood is not used in any way.

4. D. **paniculata**, Roxb. Fl. Br. Ind. ii 236. Bedd. Fl. Syl. lxxxviii. Gamble Man. Tim. 254. Brandis Ind. Tr. 236. Tam. *Panni vágei.* Mal. *Vetta tholi: meruthi.* 202

Leaf-rachis 6-7 in. with 9-13 leaflets $\frac{3}{4}$-1 in. by $\frac{2}{3}$ in. oblong, base rounded, obtuse or emarginate, pubescent along the midrib, turning black in drying. Stipules lanceolate, caducous. Flowers in dense, rusty terminal panicles, blueish-white. $\frac{1}{3}$ in. long, subsessile, standard narrow below, broad above. Stamens 10 in 2 bundles of 5. Pod narrowed at both ends, 1-2 in. by $\frac{1}{2}$ in. containing 1-2 seeds.

A medium-sized tree with light foliage and a clean grey stem, scattered through the deciduous forests of Travancore from 0-1500 ft. Height 60 ft. Diameter $1\frac{1}{2}$ ft. Occurs also in Central and Southern India, Oudh and Burmah but not in Ceylon.

Flowers appear with the new leaves in March. Fruit ripens Oct.-Jan.

Bark $\frac{1}{8}$ in. thick. grey, smooth. Wood pale yellowish-white, soft to moderately hard, with numerous narrow bands of pale loose tissue, 100 or more to inch, the wood in concentric belts separated by narrow bands of bast tissue, about $1\frac{1}{2}$ to 2 per in. Pores moderate-sized, scanty, often divided. Rays fine. fairly numerous. (Gamble).

W.—40 lbs. (average).

The wood is of no use. The Hillmen chew the bark.

5. PTEROCARPUS, Linn.

Trees with odd-pinnate leaves and alternate leaflets without stipels. Flowers yellow in panicled racemes. Calyx turbinate. Petals exserted. Stamens 10, monadelphous, the 10th stamen often free. Ovary with 2-6 ovules. Pod round, flat and thin, surrounded by a broad wing and containing 1-3 seeds.

203 **P. Marsupium**, Roxb. Fl Br. Ind. ii. 239. Bedd. Fl. Syl. t. 21. Trimen Fl. Cey ii. 90. Gamble Man. Tim. 261. Brandis Ind. Tr. 240. Tam. *Vengei*. Mal. *Venga*.

Leaf-rachis 3-4 in. long, with 5-7 oblong, obtuse, glabrous leaflets, each 3-5 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in. Racemes 3-6 in. long. Flowers bright orange, very sweet-scented, $\frac{1}{2}$ in. long, calyx brown. Pod 1-2 in. across, seed small, kidney-shaped.

A large tree common in all our deciduous forests between 0 and 3500 ft. generally much branched. Occurs also through Central and Southern India and in Ceylon. Height 80 ft. Diam. $2\frac{1}{2}$ ft.

Flowers in July-Oct or a little earlier or later. Fruits Dec.-March.

Bark $\frac{1}{3}$ in. thick. dark brown, rough and deeply cracked, juice red. Sapwood small: heartwood yellowish-brown with dark streaks, close grained, very hard but rather rough. Pores of medium size, often divided scanty, more numberous in spring and fewer in Autumn-wood. Rays extremely fine, numerous, uniform and equidistant crossed by numerous wavy bands of paler tissue Annual rings marked by larger and more numerous pores about 6 to inch. Many experiments have been made with the timber. Gamble gives as an average.

W. = 55 lbs. P. = 718.

This is one of the most important trees in the Travancore forests and it stands 6th in the list of useful woods. The growth of the vengei seems to be fairly rapid, and it is one of the trees which benefit most by fire-protection, for in places where fire has been excluded for two or three years a regular thicket of saplings may be seen It prefers a stiff soil, though it will also grow in freer soils. In those forests with a retentive soil from which teak is absent vengei appears at its best It is not a handsome tree, having a tendency to branch within 20 ft. of the ground, and the foliage is open and sparse.

The wood is durable, seasons well and takes a fine polish. It is much used in other parts of India for house building and for the construction of boats and carts, but has one defect. The resin from the wood stains chunam yellow. It is too heavy for furniture. It answers well for sleepers though it is apt to crack. It is not much appreciated in Travancore, preference being given to thambagam anjili or thembavu, but it sells readily for export. The quantity sold is about 36,000 cub. ft. a year, and its present value on the coast is 12-14 as per cub. ft. in log.

A gum-resin known as "Malabar kino" or "Dragons blood" is collected from wounds in the bark. When fresh from the tree this substance has all the appearance of blood, but when prepared for the market it appears as dark crimson transparent fragments of irregular shape. Kino is a valuable astringent much used in medicine. It dissolves readily in rectified spirit- but is not wholly soluble in water. The demand for it is uncertain and its market price fluctuates greatly. A few years ago when the demand was very great the price rose to 15 shillings per lb. It is now 9 d. per lb.

6. PONGAMIA, Vept.

Trees with odd-pinnate leaves and opposite leaflets. Flowers in axillary racemes. Calyx campanulate. Petals much exserted. Stamens 10, monadelphous, the 10th stamen free at the base. Ovary 2-ovuled, subsessible. Pod oblong, 1-seeded, trgid seed reniform.

204 **P. glabra**, Vent. Fl. Br. Ind. ii. 240. Bedd. Fl. Syl. t. 177. Trimen Fl. Cey. ii. 91. Gamble Man. Tim. 262. Brandis Ind. Tr. 243. Eng. *The Indian Beech tree* Tam. *Pungu*. Mal. *Punga* : *unju*.

Leaf-rachis 5 in. long with 5-7 leaflets, shinine, oblong yellow or red turning to bright green, each 2-5 in by 1-2 in. Flowers purple and white, ¾ in long. Pod 2 in long by 1 in. broad, thick, pointed at both ends, seed oily.

A very handsome tree of medium size, attaining a height of 60 ft. and a diam. of 1 ft. common on river banks all through the country from 0-3000 ft. Often grown in gardens and along road-sides for ornament, and also, especially in Southern Travancore, planted in groves and pollarded for manuring the paddy-fields. Common through India, Burmah and Ceylon and other parts of Asia.

Drops its leaves several times during the year. Flowers March-April. Fruits June-July.

Bark grey speckled with brown, ½ in. thick. Wood yellowish-white, often streaked with grey, coarse and cross-grained, moderately hard. No heart. Pores scanty, of medium size. Rays very fine, even, white and equidistant, crossed by broad, wavy bands of soft, white tissue, giving the wood a mottled appearance. Annual rings indistinct.

W=47 lbs.

The wood is not used except for fuel, as it is attacked by insects. "The seeds, leaves and oil are used in Hindu medicine for skin-diseases and rheumatism." The oil is thick and orange-brown and has a bitter taste. It is used for burning, The bark contains a bitter alkaloid (Pharm. Ind. ii. 468).

7. ORMOSIA, Jacks.

Trees with odd-pinnate leaves and opposite leaflets. Flowers in axillary and terminal racemes. Calyx deeply 5-cleft. Petals clawed, not much exserted. Stamens 10, alternately long and short, free. Ovary subsessile. Style,long. Pod woody, 2-valved. Seeds with a bright scarlet testa.

O. travancorica, Bedd. Fl. Br. Ind. ii. 253. Bedd. Fl. Syl. t.
205 45. Gamble Man. Tim. 265. Brandis. Ind. Tr. 243. Tam. and Mal. *Mulei mánchádi*.

Leaves about 9 in. long of 9-11 oblong, cuspidate leaflets, each 2-3 in. by 1-1½ in. glossy above, grey-downy beneath. Racemes about 1 ft. long. Flowers ½ in. long purple stripped with green, calyx brown. Pod red, thick, 2-3 in. long, containing one red seed ⅔ in. diam.

A lofty tree unbranched for a considerable height when in good soil found in all our evergreen forests between 0-3000 ft. and sometimes planted. Height 80 ft. Diam. 2½ ft. Occurs also on the Western Coast and in Tinnevelly, but not in Ceylon.

Flowers Dec.-March. Fruits May-June.

Bark grey, smooth, ⅛ in. thick. Wood white, moderately hard but bored by insects when young. Pores of different sizes large and small. Rays very fine and close together. Annual rings marked by larger pores.

W. = 41 lbs.

The rate of growth is fast. A tree planted in the Divisional Forest Officer's garden at Malayattur grew in 10 years to a heighest of 40 ft. with a diameter of 4½ in. When 15 years old the diameter was 8 in. This would give 4 rings to the inch of radius.

Nothing is known of the timber or it uses.

SUB-ORDER—2. CÆSALPINIEÆ.

Leaves bipinnate :
  Calyx cleft to base. Petals clawed.
    Stamens 10 . 1. *Poinciana.*
  Calyx campanulate. Petals oblanceolate.
    Stamens 5 . 2. *Acrocarpus.*
Leaves pinnate :
  Calyx without a tube.
    Petals 5.
      Anthers dehiscing mostly by terminal pores. Pod many-seeded. 3. *Cassia.*
      Anthers dehiscing longitudinally. Pod one-seeded . 4. *Cynometra.*
    Petals 0.
      Stamens 2 . 5. *Dialium.*
      Stamens 10 . 6. *Hardwickia.*
  Calyx with a long tube.
      Petals 0. Stamens 3-3, free . 7. *Saraca.*
      Petals 3. Stamens 2, monadelphous. 8. *Tamarindus.*
      Petals 3. Stamens 5, free . 9. *Humboldtia.*
Leaves simple, bilobed . 10. *Bauhinia.*

Three small trees with bipinnate leaves may be mentioned here. (1) *Cœsalpinia Sappan* Eng. *The Sappan tree* Tam. *Sappangu* with a prickly stem and branches, and yellow flowers. It yields a bright orange-yellow wood weighing about 60 lbs. per cub. ft. much used in dyeing. Native of Burma. (2) *C. coriaria.* Eng. *The Dividivi* or *American Sumach* with small yellow flowers, and leathery pods which yield a valuable tanning material, The wood is hard and heavy. Growth fast. Native of W. Indies, and (3) *Parkinsonia aculeata,* Eng. *The Jew's thorn* with a prickly stem and yellow flowers, used for hedges and thriving in the dry parts of the country. Native of Tropical America. All are cultivated.

1. POINCIANA, Linn.

Trees with abruptly bipinnate leaves and showy flowers in corymbose racemes. Calyx-segments valvate, oblanceolate. Petals

clawed, subequal. Stamens 10, free, much exserted. Ovary subsessile, many-ovuled, style very long. Pod flat, thin, seeds many.

206 **P. elata**, Linn. Fl. Br. Ind. ii. 260. Bedd. Fl. Syl. t. 178. Gamble Man. Tim. 269. Brandis Ind. Trees 249. Tam. *Varacchi*

Leaves 6-8 in. long of 6-16 pinnæ, and 20-40 sessile, ligulate leaflets, each ½ in. long. Flowers 3-4 in across, yelowish white turning to orange as they fade. Filaments red. Pod. 6-8 in. long by 1. in broad containing 4-8 cylindrical, brown seeds.

A tree of medium size up to 40 ft. high and 1 ft. diam. planted in avenues in Southern Travancore and run wild, but not truly indigenous. Wild in the Bombay Presidency, Arabia and Abyssinia.

Flowers in March—April. Fruits July—August.

Gamble says that the wood is yellowish-white with an irregular red heart. Pores large, scanty. Rays short, fine and not numerous, and he gives,

W=43 lbs.

The wood is said to be close-and even-grained and easily worked, and in some parts of India it is used for furniture and household utensils. It is not employed in Travancore except for fuel. The leaves are used by native physicians.

Another species *P. regia* Eng. *The Gold mohur tree* or *Flamboyant* is planted in gardens for the sake of its splendid red and yellow flowers. It grows fast and its roots spreading along the surface of the ground kill out every other plant. Wood is white and soft. W=28 lbs. Native of Madagascar.

2. ACROCARPUS, W, and A.

Trees with bipinnate leaves and racemose flowers. Calyx campanulate, cleft half way down into 5 equal teeth. Petals oblanceolate, equal, slightly imbricate. Stamens exserted. free. Ovary linear, many ovuled, style short. Pod ligulate, thin, flat, seeds many.

207 **A. fraxinifolius**, Wight. Fl. Br. Ind. ii. 292. Bedd. Fl, Syl. t. 44. Gamble Man. Tim. 290. Brandis Ind. Trees 249. Tam. *Malam konnei kurankádi: kurangan:*

Leaves of 3-4 pair of pinnæ, each about a foot long. with 10-12 opposite leaflets, elliptic-lanceolate, subsessile glabrous 3-4 in. by 1-1⅓ in. Flowers in dense, erect racemes. Calyx and petals green, ⅓ in. long. Stamens crimson. Pod long-stalked, the upper suture winged.

A very lofty tree, often with large buttresses at its base, confined to the evergreen forests with moderate rainfall such as Ariyankavu, the Cardamom hills and the High Range, and fairly common at all elevations. Conspicuous with its bright red, young leaves. Height 100 ft. Diam. 4 ft. Found also on the hill ranges of S. India, in Sikkim and Burmah.

Flowers Dec.—Jan. when bare of leaves. Fruits in May—June.

Bark thin, light grey. Wood moderately hard, sapwood white, heartwood light red. Pores medium-sized to large, often divided. Rays fine and moderately broad, wavy, scanty. Gamble gives.

W=39 lbs

Beddome says that the wood has a cedrelaceous smell, and resembles Red Cedar. It is largely used in the Wynaad and Mysore for shingles, furniture and tea-boxes, but I have never heard of its being employed for any purpose in Travancore. It reproduces easily and its growth is fast. The tree is well deserving of attention by the Forest Department.

3. CASSIA, Linn.

Trees with abruptly pinnate leaves, and yellow or pink, showy flowers. Calyx-tube very short, segments imbricate. Petals 5, subequal, imbricate. Stamens normally 10, of which 3-5 are sometimes reduced to staminodes or are absent. Anthers dehiscing mostly by terminal pores. Ovary many-ovuled. Pod cylindrical or flat, usually septate.

Pods cylindrical
- Leaflets 8-16 . 1. *C. Fistula.*
- Leaflets 18-30 . 2. *C. marginata.*

Pods flat :
- Stamens 7 : staminodes 3
  - Stipules caducous. Pod 6-12 in. long . 3. C. *siamea.*
  - Stipules foliaceous, persistent. Pod 4 in. long . 4. C. *timoriensis.*
- Stamens 10 . 5. C. *glauca.*

1. C. Fistula, Linn. Fl. Br. Ind. ii, 261. Bedd. Fl. Syl. xci. Trimen Fl. Cey. ii 103. Gamble Man. Tim. 271. Brandis Ind. Trees 253. Eng. *The Indian Laburnum!* Tam. *Konne.* Mal. *Konna.* 208

Leaves about 1 ft. long of 8-16 glabrous, ovate, acute, strongly veined leaflets, 2-6 in. by ¾-2 in. Flowers yellow, fragrant, 1½-2 in across in long drooping racemes. Pod 1-2 ft. long, cylindrical, black, ¾ in. diam. Seeds 25-100 immersed in pulp, ovoid, ⅓ in. broad, orange-brown.

A tree of medium size up to 50 ft. high and 1½ ft. diam. common through all the open and deciduous forests of the low country and up to 3,000 ft. and frequently planted for its ornamental appearance. Common through India Burmah, and in Ceylon.

Flowers in March-April coming out with the new leaves. Fruits hang on the trees till the following Feb.

Bark ¼ in. thick, smooth and pale when young, but in old trees black and rough cracking off in irregular flakes. Wood bright reddish-brown, darker in the centre, extremely hard, smooth and polishes well. Pores of medium size or large, evenly distributed, joined by wavy concentric lines of paler tissue. Rays extremely fine and numerous. Annual rings not seen.

W=72 lbs, (Gambles' average 61 lbs.) P=1047.

The timber is very useful for posts, agricultural implements, rice pounders and other purposes where strength is of importance and weight of no consequence, but it is difficult to work. It is unfortunate that the tree does not grow to a large size or it might be employed for sleepers. The pulp of the pods is purgative and is used in native medicine, especially in conjunction with tamarinds. The flowers, root and leaves are also used medicinally (Pharm. Ind. ii. 511). The bark is used for tanning. "The wood is an excellant fuel and gives charcoal of bright colour and good ring." (Gamble).

209 2. **C. marginata**, Roxb. Fl. Br Ind. ii. 262. Bedd. Fl. Syl. t. 180 (under *C Roxburghii*) Trimen Fl. Cey. ii. 104. Gamble Man, Tim. 273 Brandis Ind. Trees 253. Mal. *Kada konna*,

Leaves about 9 in. long of 18-30 oblong, obtuse leaflets, each **1-1$\frac{1}{4}$** in. by $\frac{3}{4}$-1 in. emarginate, apiculate at apex, glabrous above, pubescent beneath. Flowers in axillary racemes 3-4 in. long, pink or yellow veined with pink, $\frac{3}{4}$ in. across, bracts large. Pod cylindrical, black. 8-12 in. long and $\frac{3}{4}$ in. diam. Seed pale brown, compressed, $\frac{1}{3}$ in. broad,

A tree of middle size up to 50 ft, high and 1$\frac{1}{2}$ ft. diam. fairly common in the deciduous forests about Kulathurpuzha up to 2,000 ft. It has a drooping habit and is often planted in gardens for its ornamental appearance. Occurs in Tinnevelly and other parts of S. India and in Ceylon.

Flowers in April—May appearing with the new leaves. Fruits ripen and drop in Feb.—March.

Bark brown. Wood light brown, moderately hard. Pores medium-sized to large, often divided, evenly distributed. Rays fine and very numerous. Annual rings marked by dark lines 4 to the inch,

W = 44 lbs. (Gamble gives W = 55 lbs. Beddome 63 lbs.) P = 798.

The wood is said by Beddome to be strong and durable, but it is not considered so in Travancore and no use is made of it.

210 3. **C. siamea** Lamk, Fl. Br. Ind. ii. 264. Bedd. Fl. Syl. t. 179 (under *C. florida*) Trimen Fl. Cey. ii. 108. Gamble Man. Tim. 274. Brandis Ind. Trees 254. Tam. *Manja konngi*.

Leaves 8—12 in. long of 12-30 leaflets, each 1-3 in. by $\frac{1}{2}$-1 in oblong, strongly veined, mucronate, glabrous on both sides, glaucous beneath, stipules caducous. Racemes 6-10 in. long, forming a terminal panicle. Flowers yellow, $\frac{3}{4}$ in. across Pod flat. 8-12 in. by $\frac{1}{2}$-$\frac{3}{4}$ in. containing 8-15 seeds, sutures thickened.

A tree of medium size up to 60 ft. high and 1$\frac{1}{2}$ ft. diam. not indigenous in Travancore but naturalised in the low country. Planted as an avenue tree and also grown for pollarding. the leaves being used for manuring paddy fields. Native of Ceylon, Siam and the Malay Peninsula,

Flowers and fruits during most of the year.

Bark grey, smooth. Heartwood dark brown to nearly black, striped dark and light, hard. Sapwood whitish. Pores large and medium-sized scanty., crossed by pale wavy bands of soft and dark bands of close texture, Rays fine, irregular. Gamble gives.

W=54 lbs. P=840.

The wood is durable and ornamental and polishes well. Unfortunately it does not grow to a large size or it would be more extensively used. It gives a splendid fuel, and as its growth is rapid, it would do well for fuel plantations.

4. **C. timoriensis**, DC. Fl. Br. Ind. ii. 265. Bedd. Fl. Syl. xcii Trimen Fl. Cey. ii. 108. Gamble Man. Tim. 274. Brandis Ind. Tr 2?4. 211

Leaves 8-10 in. long of 20-30 oblong, obtuse, apiculate leaflets, 1-2 in. by ½-1 in. pubescent on both sides. Stipules large, persistent. Flowers yellow 1¼ in. across in short axillary racemes forming a large terminal head. Pod ligulate. thin 4 in. by ½ in. containing 14-20 dark brown seeds.

I found this small tree once in the forest near Ayur in the low country. Native of the Western Peninsula, Ceylon, Burmah and Malaya.

Flowers and fruits Oct.— Nov.

Gamble says that the wood is dark brown, nearly black, and resembles that of *C. siamea* and he gives.

W=57 lbs. P=594.

"The wood is used in Ceylon for building and furniture" (Gamble).

5. **C. glauca**, Lam. Fl. Br. Ind. ii. 265. Bedd. Fl. Syl. xci. Gamble Man. Tim. 271. Brandis Ind. Tr. 255. 212

Leaves 6-10 in. long with narrow, caducous stipules and conspicuous glands between the lower pairs of leaflets. of which there are 8-20, each 1-4 in. by ½-2 in. ovate, acute and glabrous. Racemes corymbose. Flowers bright yellow, 2 in. across. Pod thin, 4-8 in. long with 10-30 seeds.

I noticed this small tree once in the forest near Kulathurpuzha. It is not common in a wild state, but is often planted in gardens for its handsome flowers. Native of the Western Peninsula, Burmah and Malaya.

" Flowers throughout the year " (Brandis).

The wood is unknown.

Two shrubs may here be mentioned, both of them common in parts of Travancore, and both bearing large yellow flowers, (1) *Cassia auriculata* Tam. *Avaram* which yields the valuable " Tangedu " bark employed for tanning and for tempering iron. It grows only in the drier parts of the south and (2) *C. alata* an introduction from the West Indies. It is always found growing near water. Its leaves are a remedy for ringworm. (Pharm Ind. ii. 518).

4. CYNOMETRA, Linn.

Trees with abruptly pinnate leaves, leaflets few Flowers small in axillary racemes Calyx deeply cleft, segments imbricate Petals 5, equal, Stamens 10, equal, spreading, anthers dehiscing longitudinally. Ovary 2-ovuled. Pod 1-seeded, indehiscent,

Leaflets 2-4. Ovary hairy. Pod turgid, rugose . 1. C. *ramiflora*.
Leaflets 2 only. Ovary glabrous. Pod flat, smooth. 2. C. *travancorica*.

1 **C. ramiflora,** Linn. Fl. Br Ind. ii. 267. Bedd. Fl. Syl. t. 315. Trimen Fl. Cey. ii. 111. Gamble Man. Tim. 275. Brandis Ind. Tr. 255. 213

Leaves of 2-4, sessile, glabrous, lanceolate, unequal leaflets, 3-6 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in. Flowers rosy-white, $\frac{1}{2}$ in. across, in dense axillary, fascicles. Ovary hairy. Pod turgid. ovoid, rugose, $\frac{1}{2}$-1 in. long.

A tree of medium size, said by Beddome to be indigenous in Travancore but I have never seen it. Native of Kanara, Ceylon, Chittagong and the Malay Archipelago. Often cultivated.

Flowers in January (in Ceylon).

Gamble says that the bark is smooth, brownish-grey. Wood red, hard, close-grained. Pores small, often oval and subdivided. Rays fine and very numerous and he gives as an average

W=57 lbs. P=783.

The wood is used in house-and cart building and chips of the wood give a purple dye in water. It is used for posts for native huts and for fuel (Gamble). "The seeds yield an oil which is externally applied for leprosy and other cutanears diseases. The root is purgative." (Dict. Econ Prod.)

2. **C. travancorica,** Bedd. Fl. Br. Ind. ii. 267. Bedd Fl. Syl. t. 316. Gamble Man. Tim. 275. Brandis Ind. Tr. 255. 214

Leaves of 2 sessile, glabrous, lanceolate, unequal-sided, almost falcate leaflets 3-4 in. by 1-$1\frac{1}{2}$ in. Flowers rosy-white, $\frac{1}{3}$ in. across in short axillary racemes. Ovary glabrous. Pod flat, smooth, semicircular 1-$1\frac{1}{4}$ in. long.

"A straight tree of great height and very beautiful foliage" found by Beddome near Parapet estate above Courtallum at an elevation of 2000-3000 ft. where he found it fairly common. I do not know it. Endemic in Tinnevelly and Travancore.

Flowers in Sep.-Oct.

Nothing is known about the tree or its timber.

5. DIALIUM, Linn.

Trees with odd-pinnate leaves. Flowers small in terminal and axillary panicles. Calyx divided to base into 5 imbricate petaloid segments. Petals 0. Stamens 2 with large anthers. Ovary oblique, hairy, 2-ovuled. Pod round, compressed, one-seeded.

D. travancoricum, Bourdillon. Ind. Fr. xxx. 243. Gamble Man. Tim. 276. Brandis Ind. Tr. 251. Mal. *Malam puli* 215

Leaf-rachis 4-6 in. long with 7-11 sub-opposite or alternate short-stalked leaflets, glabrous, ovate, caudate-acuminate, rounded at the base and dark green, each 2-3 in. by $\frac{3}{4}$-$1\frac{1}{4}$ in. Panicles large. fulvous pubescent. Flowers brown, $\frac{1}{8}$ in. long, subsessile. Pod dark velvety-brown, $\frac{1}{8}$ in. broad and $\frac{1}{4}$ in. thick, with a thin brittle shell. Endocarp spongy, bright red. Seed pale brown thin.

A magnificent evergreen tree occuring in the forests of S. Travancore near Ponmudi between 1000 and 2000 ft. and very local. Height 100 ft. Diameter 3 ft. Endemic.

Flowers July-Sep. Fruits May-June.

Bark pale brown, smooth, $\frac{1}{8}$ in. thick. Wood brownish grey, marked by lines of darker colour, hard, smooth and close-grained. Centre darker but no heart. Pores rather scanty, large and evenly distributed. Rays very fine and conspicuous, crossed by numerous concentric lines of paler tissue. giving the wood a mottled appearance. Annual rings marked by darker lines, 10 to the inch.

W. = 57 lbs. P = 894.

Nothing is known of the tree or its uses. It is well worth cultivating for its ornamental appearance, and its timber would probably be serviceable, 'but it is bored by beetles'.

6. **HARDWICKIA**, Roxb.

Trees with odd-or abruptly-pinnate leaves. Flowers small in terminal. panicled racemes. Calyx cleft almost to the base into 5 (or 4) petaloid segments, persistent, imbricate. Petals 0. Stamens 10 (or 8). Ovary sessile, 2-ovuled. Pod dry, indehiscent, 1-seeded.

216 **H. pinnata**, Roxb. Fl. Br. Ind. ii. 270. Bedd. Fl. Syl. t. 225- Gamble Man. Tim. 277. Brandis Ind. Tr. 250. Tam *Madeyan sám. piráni* : *koda palai*. Mal. *Shurali* : *kiyavu*.

Leaf-rachis 4-6 in. long with 4-7 alternate, ovate, lanceolate leaflets, each 2-4 in. by 1-2 in. dark green, glabrous and shining. Flowers white. $\frac{1}{8}$ in, across with long stamens. Pod about 2 in. long and I in. broad, oblong, much compressed, dark brown and woody, containing one seed.

A lofty and very handsome evergreen tree abundant in the forests of Travancore from 0-3000 ft., especially common about Ariyankavu. Height 100 ft. Diam. 4 ft. Occurs also in Malabar and Tinnevelly.

Flowers in Jan. and July. Fruits in May and Oct.

Bark dark brown and green, rather rough, $\frac{1}{4}$ in. thick. Sapwood 3 in. thick, white and perishable. Heartwood dark reddish-brown to red, straight-grained and even, moderately hard, and polishes well. Pores scanty, large and moderate-sized, often divided. Rays very fine, equidistant, faintly seen. Annual rings marked by dark lines about 12 to inch.

W = 46 lbs. P = 640.

The wood is used for planking and is coming into use in Malabar for cabinet-work and furniture under the name of "Malabar Mahogany," for which its ornamental appearance makes it very suitable.

A dark resin, having the smell and taste of copaiba, exudes from the heartwood. It is recommended as a dressing for the sores of elephants.

7. SARACA, Linn.

Trees with abruptly pinnate leaves and flowers in dense corymbs with coloured bracts. Calyx petaloid, with a long tube and 4 spreading, unequal segments. Petals 0. Stamens 3-8 with long filaments. Ovary stalked, many-ovuled. Pod flat, dehiscent, 2-3 seeded.

S. Indica, Linn. Fl. Br. Ind. ii. 271. Bedd. Fl. Syl. t. 57. Trimen Fl. Cey. ii. 114. Gamble Man. Tim. 278. Brandis Ind. Tr. 250. Eng. *The Asoka tree.* Tam. *Asavu.* 217

Leaf-rachis 6-9 in. long, pendulous when young of 8-12 lanceolate, acute, glabrous, opposite leaflets, each 3-2 in by 1-1½ in. Flowers orange turning to scarlet, sweet-scented, nearly 1 in. across in dense corymbs 3-4 in. across. Pod 4-10 in. by 2 in. tapering to both ends, leathery, containing 2-8 ovoid, slightly compressed seeds each about 1½ in. long.

A small tree common along the road from Ariyankavu to Puliyara; and frequently planted for ornament. Height 30 ft. Diam. 8 in. Occurs also in Eastern Bengal, Burmah, the Western Peninsula and Ceylon. Much cultivated for its beauty and its scented flowers.

Flowers Jan.-March Fruits May-June.

Gamble says that the wood is "light reddish-brown, soft; occasional faint brown concentric belts of soft tissue. Pores moderate-sized, in radial, and frequently oblique lines. Medullary rays fine- scanty indistinct" and he gives

W. = 36 lbs.

Beddome says that as a shade-yielding, ornamental tree it scarcely has an equal " and Gamble remarks that it is one of the most important sacred trees in India, its flowers being used in temple decoration." The bark is used for stopping hæmorrhage. It contains a large quantity of gallic acid. (Dict. Econ. Prod.)

8. TAMARINDUS. Linn.

Trees with abruptly pinnate leave and numerous small leaflets. Flowers in lax racemes. Calyx-tube turbinate, segments 4 much imbricated. Petals 3. unequal. Stamens 3, united for half their length Ovary stipulate with many ovules. Pod thick, succulent, traversed with fibres, containing numerous seeds.

T. indica, Linn. Fl. Br. Ind. ii. 273. Bedd. Fl. Syl. t. 184. Gamble Man. Tim. 278. Brandis Ind. Tr. 252. Eng. *The Tamarind tree.* Tam. and Mal, *Puli.* 218

Leaf-rachis 4-5 in. long with 20-40 obtuse, oblong, sessile, glabrous leaflets ½-¾ in. by 1/5 in. Flowers pale yellow streaked and spotted with crimson, ¾ in. across. Pod dark brown 3-6 in. by 1 in. containing 3-10 seeds dark brown and smooth, compressed,

A magnificent tree attaining a height of 120 ft, and a diameter of 5 ft. not indigenous in Travancore, but run wild and found all through the low country and up to an elevation of about 1000 ft. Often planted along roadside as an avenue tree, but its growth is slow, otherwise it is one of the best avenue trees, as it is always in leaf. It changes its foliage in March-April. Indigenous in Abyssinia and Central Africa.

Flowers in April-May. Fruits in Feb.-March.

Bark dark grey, ⅓ in, thick, deeply cracked. Wood hard- close grained; sapwood yellowish white, sometimes with red streaks. heartwood small dark purplis-brown, only seen in very old trees. Pores moderate-sized, uniform, each pore or group of pores surrounded by round patches of soft tissue. Rays very fine. Very numerous, uniform. Annual rings, indistinct (Gamble).

W = 73 lbs. P = 771 (Gamble's averages).

The wood is used for oil-presses, sugar mills, rice pounders, mallets and planes, but it is apt to split. It is very difficult to work, and is said not to be durable if exposed to the weather. It is an excellent fuel. According to Beddome it burns green and "is esteemed as excellent for gunpowder-charcoal." The most valuable produce of the tree is its fruit, the pulp of which is astringent and aperient. It is much used by all classes in condiments and for curing fish. Tamarind water is an agreeable drink. Large quantities of tamarinds are shipped to Persia and other countries, as well as to Europe where it is used for pharmaceutical purposes. The seeds and leaves are also used medicinally in this country. From old trees a peculiar exudation, consisting almost entirely of oxalate of calcium, flows from the trees in a liquid state, but afterwards dries into white masses. (Pharm: Ind, ii. 533).

9. HUMBOLDTIA, Vahl.

Trees with abruptly pinnate leaves and persistent, double stipules. Flowers in axillary racemes, each furnished with coloured bracteoles. Calyx-tube turbinate, segments 4 or 5, equal, petaloid. Petals 5, sub-equal. Stamens 5, much exserted, alternating with 5 minute staminodes which are sometimes absent. Ovary few-ovuled, style long. Pod flat, dehiscent.

Leaflets 1 pair.	1. *H. unijuga*.
Leaflets 3-6 pair.	
Leaf-rachis flattened: leaflets 3-4 in. long.	2. *H. sp. nov.*
Leaf-rachis terete: leaflets 5-7 in. long.	3. *H. vahliana*.
Leaf-rachis winged: leaflets 6-12 in. long.	4. *H. decurrens*.

219 1. **H. unijuga,** Bedd. Fl. Br. Ind. ii. 274. Bedd. Fl. Syl. t. 183. Gamble Man. Tim. 280. Brandis Ind. Trees 252.

Leaves on short petioles, consisting of one pair of subsessile, lanceolate, acuminate, leaflets 5-7 in. by 1¾-2 in. unequal at the base. Stipules ¼ in. long. Flowers crimson, about 1 in. long, in short racemes from the trunk and older banches. Pod flat, thin, 3 in. long containing 2-3 seeds. A rather small tree occuring in the evergreen forests about Agusthirmalai at an elevation of 2000-3000 ft. Very local. Height 40 ft. Diameter 8 in. Endemic.

Flowers in Jan.-Feb. Fruits May-June.

Nothing is known of this tree or its uses, though Beddome states that it is said to yield a very hard, durable timber.

2. **H. Bourdilloni**, Prain; Brandis. Ind. Tr. 708. Mal. Adimundan. The leaf-rachis is 3/7 in. long with 3 or 4 pairs of leaflets, each 4-7 in by $1\frac{1}{2}$-$1\frac{3}{4}$ in. The legume is eaten by the Hillmen. Bark $\frac{1}{4}$ in. thick, greenish purple, rather smooth. Wood hard, rough, greyish-brown. Pores medium sized to large, evenly distributed. Rays fine and numerous but indistinct 220

W=48 lbs. P=514.

Leaf-rachis flattened, about 3 in. long of 3 pair of lanceolate, acuminate, glabrous, sessile leaflets 2-4 in. by $\frac{3}{4}$-1 in. Inflorescence corymbose, sub-sessile, or on short stalks on the stem and branches. Flowers 5-10 together, 1 in. long and $\frac{3}{4}$ in. across on $\frac{1}{2}$ in. stalks, petals white veined with pink, sepals crimson. Pod 4 in. by 1 in. thin, bright red, pubescent.

A handsome tree attaining a height of 50 ft. and a diameter of 15 in. observed by me on the Peermerd road at 2,500 ft. in evergreen forest. Not found elsewhere. It differs from *Hvahliana*, to which it is most akin, by its flattened leaf-rachis and small sessile leaflets, its corymbose inflorescence borne on the stem. and its more brightly coloured flowers with long calyx-tubes.

Flowers and fruits in Jan.—Feb.

The timber is unknown. The tree is worth cultivating for its ornamental appearance.

8. **H. Vahliana**, Wight. Fl. Br. Ind. ii. 274. Bedd. Fl. Syl. xciii. Gamble Man. Tim. 280. Brandis Ind. Trees 252. Tam. *Atta vanji.* Mal. *Koratthi: kara pongu.* 221

Leaf-rachis terete, about 6 in. long of 3-4 pair of lanceolate, acuminate, glabrous, reticulate, opposite leaflets, 5-7 in. by $1\frac{1}{2}$ in. on $\frac{1}{3}$ in. petiolules. Stipules 1 in. Flowers $1\frac{1}{2}$ in. long and broad, white with buff calyx, in 3-4 in. racemes. Pod very flat, thin and pubescent, pale brown, 6-8 in. by $1\frac{1}{2}$-2 in. containing about 4 seeds.

A tree of moderate size common on the banks of rivers throughout Travancore up to 1,000 ft. Height 50 ft. Diameter $1\frac{1}{2}$ ft. Occurs also in Tinnevelly and on the Nilgherries.

Flowers Dec.—Feb. Fruits may-June.

Bark dark brown mottled with white, rough, $\frac{1}{4}$ in. thick. Wood light brown, moderately hard. Pores large, scanty, usually subdivided. Rays numerous, fine but indistinct.

W = 40 lbs. P = 442.

The wood is said to be worthless except for firewood.

4. **H decurrens**, Bedd. Hook. Ic. Plant. t. 2368, Gamble Man. Tim. 280. Brandis Ind. Trees 252. mal. *Kunthâni: malam thodappu: nyânoli.* 222

Leaf-rachis broadly winged, about 1 ft. or more long. Leaflets 5-6 pair, opposite, sessile, pink or white and pendulous when young, dark green when mature, 6-12 in. by 2-4 in. Stipules up to $2\frac{1}{2}$ in. long Flowers pink, 20-30 together in pendulous racemes 2-3 in. long from the leaf-axils and the old wood, each flower $\frac{3}{4}$ in. long. Pod, thin, brown, tomentose, 4 in. by $1\frac{1}{4}$ in. containing 2-3 round, flat seeds $\frac{3}{4}$ in. broad.

A tree of moderate size, very common in the evergreen forests between 500 and 3000 ft. about Ponmudi, but confined to a few valleys and absent from N. or S. Travancore. Endemic. Its long pendulous white leaves, looking like rags of cloth hung about the tree, make it very conspicuous. Height 50 ft. Diameter 1 ft.

Flowers Jan -April. Fruits May-June.

Bark bluish-green, $\frac{1}{6}$ in. thick. No heartwood but the centre is darker. Wood greyish brown. coarse and rough, moderately hard. Pores of medium size, usually subdivided, joined by wavy lines of soft tissue. Rays extremely fine and closely packed.

W = 42 lbs. P = 716.

Nothing is known of the wood or its uses.

10. BAUHINIA, Linn.

Trees with simple, 2-lobed leaves. Flowers in racemes. Calyx of 5 valvate segments or spathaceous, Petals 5, spreading, equal or unequal. Stamens 10, distinct. Ovary stipitate, many-ovuled. Pod linear.

Calyx spathaceous. Petals unequal. Pod curved, 12-20 seeded. — 1. *B. racemosa.*
Calyx 5-dentate. Petals equal. Pod straight 20-30 seeded. — 2. *B. malabarica.*

1. **B. racemosa,** Lam. Fl. Br, Ind, ii. 276. Bedd. Fl. Syl. t, 182. Trimen Fl. Cey. ii. 116. Gamble Man. Tim. 281. Brandis Ind. Trees 256. Tam. *Váttatthi: Malei átthi.*

Leaves broader than long, 1½-2 in. by 2 2½ in. truncate at base, ovate but divided a third down into two rounded lobes, glabrous. Petiole ½-¾ in. Flowers yellowish-white, ½ in across in loose terminal and leaf-opposed racemes 4-6 in. long. Pods 8-10 in. by ¾ in. curved leathery, blackish-brown with 12-20 seeds.

A much-branched, crooked tree attaining a height of 30 ft. and a diam. of 1 ft. found only in the drier sub-alpine forests of Travancore, such as those near Anjinad, Puliyara and Panagudi. Occurs throughout India and in Burma and Ceylon.

Flowers March-April. Fruit ripens about November, but it hangs on the tree for some months longer.

Bark very rough, dark brown, ¾ in. thick. Wood hard, pinkish-red when cut, turning to brown, with dark patches near the centre in alternate bands of hard and soft tissue. Pores of medium size, scanty and irregular. Rays numerous and very fine. No annual rings.

W = 49 lbs. P = 433.

The wood is elastic and would polish well, but it is not strong: it is therefore not used except for fuel. The most useful product of the tree is its bark which gives a strong and durable rope. Beddome says that "matchlock-men almost always make their slow matches from the bark, which is boiled, dried and beaten, and then burns well and slowly without any substance being mixed with it." The juice of the fresh leaves mixed with pepper is applied for feverish headaches. The bark is highly astringent and is used for dysentery. The tree is much esteemed by the Hindus. (Pharm Ind. ii. 537.)

2. **B. malabarica,** Roxb. Fl. Br. Ind. ii. 277 Bedd. Fl. Syl. 224
xcii. Gamle Man. Tim. 282. Brands Ind. Trees. 256. Tam. *Atthi* Mal. *Aram puli.*

Leaves 2-4 in. by 3-5 in. broader than long, slightly cordate, ovate but divided a quarter down into two rounded lobes, glaucous beneath. Petiole $1\frac{1}{2}$ in. Flowers cream-coloured, often unisexual, $\frac{1}{3}$ in. across, in dense axillary racemes. Pod 1 ft. long by $\frac{3}{4}$-1 in. broad, straight, dark brown, containing 20-30 seeds.

A medium-sized tree of the deciduous forests, common through Travancore between sea-level and 2000 ft. Height 50 ft. Diameter $1\frac{1}{4}$ ft, Occurs all over India and Burmah but not in Ceylon.

Flowers Sep.-Oct. Fruits march-April.

Bark brown, rough, $\frac{1}{2}$ in. thick Wood dark reddish brown with an irregular patch of purple wood in the centre, moderately hard, close-grained but rather coarse and uneven. Pores medium-sized to large, scanty, often divided. Rays extremely fine and numerous, crossed by wavy, white, concentric bands giving the wood a mottled appearance. Annual rings none.

W = 55 lbs. P = 563.

The wood does not seem to be used in any part of India. Gamble says that it is rather poor, and of use only for fuel. The leaves are acid and may be eaten.

Another species *B, phoenicea* a very large climber with brick-red flowers about 3 in. across is common in our evergreen forests. It is very destructive, twining round and compressing the forest trees, and should be cut whenever seen.

SUB-ORDER 3. MIMOSEÆ.

Stamens 10. Anthers with deciduous apical glands	
Leaflets 1 in. long. Flowers racemose.	1 *Adenanthera*
Leaflets 3-9 in. long. Flowers in globose heads	2. *Xylia.*
Stamens many. Anthers without glands	
Armed trees. Stamens free.	3. *Acacia.*
Unarmed trees. Stamens monadelphous.	
Pod thin. straight. sutures not thickened.	4. *Albizzia.*
Pod thick, falcate, sutures thickened.	5. *Calliandra.*
Pod thin, twisted, sutures not thickened.	6. *Pithecolobium.*

1. ADENANTHERA, Linn.

Trees with bipinnate leaves and very small flowers in axillary racemes. Calyx campanulate, slighly toothed. Petals 5, valvate, cohering at base. Stamens 10, free, terminating in a gland. Pod narrow, thin, tomentose, often twisted.

A. **pavonina,** Linn. Fl. Br. Ind. ii. 297. Bedd. Fl. Syl. t. 46.
Trimen Fl. Cey. ii. 120. Gamble Man. Tim. 287. Brandis Ind, 225
Trees 262. Tam. *Anei kundumani* Mal. *Manchadi.*

Leaf-rachis 8-12 in. long, pinnæ 3 or 4 pair with 8-20 alternate leaflets on each pinna, leaflets oval-oblong, rounded at both ends,

unequal, glabrous and thin, 1-1½ in. by ¾-1 in. Flowers greenish-yellow, fragrant, ⅛ in. across in stalked racemes about 5 in. long. Pod 6 9 in by ⅝ in. dark brown twisting after dehiscence, containing 8-10 circular, compressed, shining and scarlet seeds, ⅜ in. diameter.

A handsome, erect, deciduous tree extensively planted for ornament throughout Travancore, and naturalised here, but not indigenous, Height 60 ft. Diameter 1 ft. Occurs also in North India, Burmah, Ceylon and China.

Gamble says that the "bark is grey. Wood hard, close-grained." "sapwood grey, heartwood red. Pores small, scanty, in groups or" "short radial lines. Medullary rays very fine, extremely numerous" and he gives

W = 56 lbs. P = 902.

Beddome speakes highly of the timber saying that "when fresh" "cut, it much resembles red sanders, and has a pleasant smell ; it is" "strong but not stiff, hard durable, tolerably close-and even grained" "and takes a good polish" and states that it is used for house-building and cabinet purposes. The wood yields a red dye. The seeds weigh 4 grains each, and are used as weights by jewellers. They contain an oil.

The tree grows rapidly and is deserving of attention. It is said to yield a good fuel and would grow well in plantations.

Allied to the above are *Dichrostachys cinerea.* Tam. *Vedda thalei* a rigid thorny shrub sometimes almost a tree, with small yellow and purple flowers in dense spikes. It is found only in the drier forests near Puliyara and Aramboli. Also *Entada scandens* Tam. *Thellikai* Mal. *Kakka valli vatta valli paranda, makkan ka* an immense climber, with twisted stems, small yellow flowers in spikes, and huge pods containing 4 or 5 compressed, brown, shining seeds. The seeds are eaten by the Hillmen, and are hollowed out into small boxes to hold tinder, matches or snuff. The plant itself is very destructive and should be cut.

2. XYLIA. Benth.

Trees with bipinnate leaves and small flowers in globose heads Calyx tubular, 5-toothed. Petals 5, valvate, equal cohering at base Stamens 10, free, terminating in a gland. Pod large, woody, flat with many seeds.

226 **X. dolabriformis,** Benth. Fl. Br. Ind. ii 286. Bedd. Fl. Syl. t 186, Gamble Man. Tim. 285. Brandis Ind. Tr. 262. Tam. *Irul.* Mal. *Irumulla: kada pángal.*

Leaves bipinnate, consisting of one pair of pinnæ, each pinna with 4-12 opposite, sessile leaflets, each 3-9 in. by 1-2 in oblong, acuminate and glabrous. Flowers cream-coloured, very small, in globose heads ¾ in. diam. Pod 4-6 in. by 2-2½ in. dark brown containing 6-10 compressed, brown, shining seeds.

A tree of medium size common in the deciduous forests north of the Vamanapuram river from sea level to 2000 ft. but absent from S. Travancore. It seldom reaches a height of more than 60 ft. and a diam. of 2 ft. It is often gregarious. Elsewhere it occurs in Malabar and S. India, Bombay, Orissa and Burma, but not in Ceylon.

Flowers while leafless in March and April. Fruit ripens about December.

Bark $\frac{1}{4}$ in. thick reddish-grey. Sapwood small, pale : heartwood reddish-brown, extremely hard, cross-grained. Pores medium-sized to large, filled with resin, often divided, and arranged in oblique lines. Rays very numerous, fine and undulating. No annual rings.

W = 59 lbs. P = 847.

This tree reproduces itself well, and in many parts of the country it may be seen coming up in dense groves after the land has been cultivated and abandoned. As pointed out by Gamble, fire does not retard but encourages the germination of the seed by destroying the thick outer covering of the pods. The young plants bear shade well and are not eaten by cattle. Measurements of trees planted at Malayattur showed at 5 years old, height 25 ft. girth 10 in.

at 10 ,, do. ,, 60 ft. ,, 22 in.

This would equal about 3 rings per inch. Gamble gives 5 rings per inch. The tree does not seem to thrive well at the lower elevations where it is most common but it is badly shaped, fluted and twisted. At 1500 ft. and upwards, where it is not so abundant it attains a larger size. Its absence from S. Travancore is curious.

The wood is very durable owing to the resin contained in it. In Burmah it is very largely used for railway sleepers and paving blocks, It is employed there for boat-building, agricultural implements carts and tool-handles. In Travancore it is utilised for the rafters and beams of houses. and for bridge work, as it lasts well under water. The timber is difficult to cut and too heavy for ordinary work. It is also liable to split when exposed.

The present value on the coast is 12 Rs. a candy, or 12 annas a cubic foot in log. The quantity sold each year averages about 1600 candies or 25.000 cubic feet.

3. ACACIA, Willd.

Trees with sharp, stipular spines and bipinnate leaves, leaflets small Flowers very small, in heads or spikes, often polygamous. Calyx campanulate, toothed. Petals connate into a 5-lobed corolla. Stamens indefinite, free, not gland-tipped. Pod dry, dehiscent, with several seeds.

The tree-*Acacias* found in Travancore are confined to the dry region. and are seen only in the Anjinad valley in N. Travancore, near Shencottah, and in the extreme South.

Flowers in globose heads.	
Heads axillary.	
Pods constricted between the seeds.	1. *A. arabica.*
Pods not constricted.	2. *A. planifrons.*
Heads in terminal panicles.	3. *A. leucophloea.*
Flowers in spikes.	
Stipules spinescent, spines straight, long	4. *A Latronum.*
Stipules not spinescent, spines curved, short.	
Pinnæ 9-18 pair.	5. *A. Sundra.*
Pinnæ 4-6 pair.	6. *A. ferruginea.*

227 1. A. **arabica,** Willd; Fl. Br. Ind. ii. 293; Bedd. Fl. Syl. t.47; Gamble Man. Tim 292; Trimen Fl. Cey. ii. 122; Brandis Ind. Trees 264. Eng. *The Babul tree.* Tam. *Karivelam.*

Leaf-rachis 2-2½ in. pubscent, pinnæ 3-6 pair, leaflets 20-40, linear, sub-sessile, ⅛ in. long. Stipular spines straight, ½-2 in. long or absent. Flowers golden-yellow, ⅛ in. long, in dense, globose heads, ½ in. diam. 2-5 together in the leaf-axils. Pod much constricted between the seeds, densely covered with grey down, 8-12 seeded.

A tree of moderate size up to 30 ft. high and 1 ft. diam common in the dry forests of Travancore at low elevations.

Occurs througout India and in Ceylon, but probably wild only in Sind and the Northern Deccan, though naturalised everywhere in the drier parts.

Flowers June-July. Fruits Dec.-Jan.

Bark very rough dark brown. Wood hard, sapwood whitish, heart-wood pink, darkening with exposure, marked with dark streaks. Pores moderate-sized to large, often divided surrounded by patches of pale, loose tissue. Rays fine and moderately broad. Gamble gives as an average,

$$W = 54 \text{ lbs.} \quad P = 880.$$

but Lushington's experiments give an average of 74 lbs. per cub. ft. (Ind. For. xxi. 255.)

Owing to its being confined to so small an area in Travancore the Babul is not regarded as an important tree, though its timber is very valuable. Gamble mentions that the wood is durable, if seasoned, and that in other parts of India it is used extensively for wheels, well-curbs, sugar and oil-presses, agricultural implements and boat-building. It is a good fuel and is largely consumed on some railways. The gum, which exudes abundantly during the hot weather, is collected in large quantities, and is used in native medicine and in dyeirg and cloth-printing, its colour varies from pale yellow to deep reddish-brown. The lac-insect feeds on this tree. The bark is used for dyeing and tanning, being a powerful astringent, while the pods are employed in tanning, and the branches and leaves for fodder.

Gamble states that its reproduction is often difficult as in many places the seeds are destroyed by insects. The tree coppices well. Experiments undertaken to determine the rate of growth show that this tree increases at the rate of from 2-3 rings to 5 rings per inch of radius. The growth appears to be more rapid in Northern India, where too the tree attains a larger size (up to 80 ft. high and 14 ft. in girth) than in the South.

228 2. **A. planifrons,** W. and A; Fl. Br. Ind. ii. 293; Bedd. Fl. Syl. xcv; Trimen Fl. Cey. ii. 123; Gamble Man. Tim. 292; Brandis Ind. Trees 264. Eng. *The Umbrella thorn.* Tam. *Odei: sálei.*

Leaf-rachis about 1 in. with 3-5 pair of short pinnæ, placed close together, leaflets 10-20, very minute, strap-shaped, obtuse. Spines of two kinds (a) straight, white, 1-2 in. long (b) brown, short and

slightly curved. Flowers creamy, white, minute, sessile in dense, globose, axillary heads ⅜ in. diam. Pod 2-3 in. by ¼ in. cylindrical, glabrous, curved nearly into a ring.

A remarkable tree with a very flat, dense top, looking as if it had been artificially flattened, common near Aramboli and Puliyara and in the drier forests. Height 30 ft. Diam. 1 ft.

Occurs also in S. India and Ceylon.

Flowers Oct.-March. Fruits May-June.

Bark ¼ in. thick, greyish-brown with horizontal markings. Wood hard, sapwood white, heartwood red. Pores small to large, enclosed in white patches of loose tissue, often divided. Rays fine and numerous.

The wood is very heavy and, when fresh cut has a faint smell of onions. It is used for agricultural implements and fuel, for which purposes it is well suited. The pods are used as food for sheep and goats in the dry season. (Gamble).

3. **A. leucophloea,** Willd ; Fl. Br. Ind. ii. 294 ; Bedd. Fl. Syl. t. 48 ; Trimen Fl. Cey. ii. 125 ; Gamble Man. Tim. 295 ; Brandis Ind Trees 265. Tam. *Vel vélam.* 229

Leaf-rachis 2½-3 in. long, densely pubescent, pinnæ 5-15 pair, leaflets 30-50, very small, liner, sessile and close packed. Spines red, small. straight and strong. Flowers yellowish-white, in globose heads arranged in terminal panicles. Pods linear, 3-6 in. by ¼ in. slightly curved, clothed with brown tomentum, seeds numerous.

A tree of medium size confined to the dry forests. Height 30 ft. Diam. 1 ft. Occurs also through India, and in Burmah and Ceylon.

Flowers Aug.-Nov. Fruits May June.

Bark ⅓ in. thick, grey and smooth when young, dark brown and rough when old. Wood hard, sapwood large, heartwood reddish-brown streaked with darker shades. Pores of medium size, uniformly distributed. Rays white, fine and moderate sized, often slightly bent. (Gamble).

W = 55 lbs. P = 861.

The wood is good, seasons well and takes a good polish, strong and tough, but often eaten by insects. It is an excellent fuel. The bark has been eaten in times of scarcity. It is used in the distillation ofpalm-spirits to precipitate by its tannin the albumen in the juice. It gives a fibre for nets and coarse cordage. The young pods and seeds are eaten, and the gum used in Native medicine. (Gamble).

4. **A. Latronum,** Willd ; Fl. Br. Ind. ii. 296 ; Bedd. Fl Syl. xcv ; Gamble Man. Tim. 299 ; Brandis Ind. Trees 265. Eng. The *Robber-thorn tree.* Tam. *Károdei : nirodei.* 230

Leaf-rachis 2 in. long. with 3-5 pairs of pinnæ, each ¾ in. long, leaflets 20-40, minute. Thorns of two kinds, thin, solid and ½ 1 in. long, and stout, hollow, ivory-white 2 in. long. Flowers fragrant, yellowish-white, in lax spikes 1½-2 in. long. Pod thin, dark brown, shining, 1½-2 in. by ½-¾ in. with 2-4 seeds.

A very thorny shrub or small tree, very abundant and gregarious, forming impenetrable thickets on the Eastern slopes of the Mahendraghiri Reserve. Occurs on the dry hills in the Deccan, but not in Ceylon.

Flowers June-July. Fruits Jan.-Feb.

Bark $\frac{1}{2}$ in. thick, very rough, dark reddish-brown. Wood very hard, sapwood light brown, heartwood small, red. Pores moderate-sized, often divided, surrounded by pale, loose tissue. Rays moderately broad, (Gamble.)

W = 69 lbs.

The wood is too small to be of any use except for fuel.

231 5. A. **Sundra**, DC: Fl. Br. Ind. ii. 295: Bedd. Fl, Syl. t. 49. 50; Trimen Fl. Cey. ii, 125; Gamble Man Tim. 296. (under *A. Catechu*); Brandis Ind. Trees 267; Eng. *The Cutch tree.* Tam. *Karungáli.*

Leaf-rachis 4-5 in. with a large gland between each pair of pinnæ, glabrous, pinnæ 9 18 pair, 1-1$\frac{1}{4}$ in. long, leaflets 30-100, $\frac{1}{8}$ in. long, sessile, linear Prickles in pairs brown, curved, shining, infrastipular. Flowers pale yellow, in cylinderical, axillary spikes 3-4 in. long. Pod 3-5 in. by $\frac{1}{2}$ in. wide, straight, thin, dark brown, containing 4-6 compressed, greenish-brown seeds.

A small, thorny, deciduous tree found, though rarely, in the dry forests about Aramboli and Panagudi. Occurs through India, Burmah and Ceylon.

Formerly, this tree used to be considered distinct from *A. Catechu* but it has now been decided that *A. Catechu A. catechuoides*, and *A Sundra* are all varieties of the same species, which has a wide distribution. The glabrous variety which occurs in S. India is the last named. (Gamble Man. Tim. 296.)

Flowers May-Oct. Fruits Feb.-March.

Gamble says that the bark is dark greyish-brown, rough. Wood very hard, sapwood yellowish-white, heartwood red. Pores moderate-sized to large, often divided. surrounded by narrow rings of soft tissue. Rays short, moderately broad, numerous. Annual rings sometimes present, and he gives as an average

W = 65 lbs. P = 847.

In other parts of India and Burmah this tree is highly valued, but it is too rare in Travancore to have attracted any attention. The wood seasons well, takes a fine polish, and is extremely durable. It is not attacked by white ants or by the teredo. It is used for rice-pestles, oil-and sugarcane-crushers, agricultural implements, bows spear and sword-handles and wheel wrights' work. It is a good fuel. The most important product of this tree is Kath, or Cutch. In Northern India, under careful preparation, it is a pale cinnamon-coloured, biscuit-like substance called Kath which is valued as an astringent for chewing with betel, and fetches a comparatively high price. It is obtained by cutting the wood into chips, and then placing them in a sieve inside, a boiler with water below. As the

water boils the steam passes through the chips and extracts the Kath, which is taken off as a sediment and dried. In Burmah and other parts of India the product of the tree is called Cutch. It is a black, shining extract, used as a tanning material, and exported to Europe for that purpose. (Gamble.)

The tree reproduces itself readily from seed or in coppice, and is very useful in quickly reclothing bare slopes and patches. Artificial reproduction is best done by sowings, transplants giving very poor results. The growth is fairly fast, varying from 4 to 5 rings per inch (Gamble).

6. **A. ferruginea,** DC; Fl. Br. Ind. ii. 295: Bedd. Fl. Syl. t. 51; Trimen Fl. Cey. ii. 126; Gamble Man. Tim. 298; Brandis Ind. Trees 266. 232

Leaf rachis 3-6 in. long, glabrous, pinnæ 4-6 pairs, $1\frac{1}{2}$-2 in. long, leaflets 30-60, linear oblong, grey $\frac{1}{3}$ in. long. Prickles in pairs, small, infra-stipular, slightly curved. Flowers in pale yellow, in slender, erect, axillary spikes 3-4 in. long. Pod glabrous, 3-7 in. by $\frac{3}{4}$ in. 4-6 seeded.

A tree of moderate size which may probably be found in the dry forests about Panagudi though it has not yet been observed. Occurs on both sides of the Southern Peninsula and rarely in Ceylon.

Flowers in August.

Gamble says that the bark is $\frac{1}{2}$ in. thick, rough. Wood very hard, sapwood large, yellowish-white; heartwood olive-brown. Pores of moderate size, generally single. Rays short, pale, numerous and fine, and he gives

W.=70 lbs. P.=798.

The wood is used for building, carts and agricultural implements.

4. ALBIZZIA, Durazz.

Unarmed trees with bipinnate leaves and small flowers in globose heads or umbels. Calyx tubular, segments very short Petals connate half way up. Stamens numerous, monadelphous at base, not gland tipped, much exceeding the corolla. Pod large, flat, thin, straight and many seeded.

Pinnæ 2-6 pair.
- Leaflets 3-9 pairs, each 1-2 in long.
  - Leaflets with prominent nerves. Flowers sessile. Pod brown . 1 *A. procera.*
  - Leaflets reticulate. Flowers stalked. Pod straw-coloured . 2. *A. Lebbek.*
- Leaflets 10-20 pair, under 1 in. long . 3. *A. odoratissima.*

Pinnæ 8-20 pair.
- Leaflets with midrib close to upper edge; stipules large . 4. *A. stipulata*
- Leaflets with midrib nearly central: stipules minute . 5. *A. amara.*

1. **A. procera,** Benth; Fl. Br. Ind. ii. 299; Bedd. Fl. Syl. xcvi; Gamble Man. Tim. 305; Brandis Ind. Trees 271. Eng. *The White Siris tree.* Tam. *Vel vágei,* Mal. *Karun thagara; jala vága.* 233

Young shoots silky-pubescent, leaf-rachis about 12 in. long, pinnæ 3-5 pair, each 5-10 in. long, leaflets 10-20, obliquely oblong, 1-2 in. by $\frac{1}{2}$-1 in. unequal-sided, with 6-10 prominent lateral nerves, pale beneath. Flowers $\frac{1}{3}$ in. to end of filaments, yellowish-white, 20-30 together, in globose heads $\frac{3}{4}$ in. diameter, arranged in terminal and axillary panicles. Pod thin, glabrous, dark brown, 4-8 in. by $\frac{3}{4}$-1 in. containing 8-12 compressed seeds.

A large tree with handsome foliage, reaching a height of 70 ft. and a diameter of 2 ft., common on the lower slopes of the deciduous hill-forests up to 2000 ft. all through Travancore. Renews its foliage in the dry season, but rarely quite leaflets. Occurs also in Bengal, Bombay, Burmah and the Andamans but not in Ceylon.

Flowers June—Aug. Fruits December—February.

Bark yellowish-grey, smooth, $\frac{1}{2}$ in. thick. sapwood 2-3 in. thick-yellowish-white, not durable. Heartwood dark brown streaked with lighter brown, rather coarse, hard, fibre long. Pores moderate-sized and large, evenly distributed, prominent on a longitudinal section. Rays very fine, short and few. Annual rings indistinctly marked by dark lines two or three to the inch.

W.=45 lbs. P.=738.

The wood is straight and even-grained, seasons well and the heart wood is durable. It is used for sugarcane-crushers rice-pounders wheels, agricultural implements, bridges and house posts (Gamble). In Travancore it is used to a large extent for furniture and buildings. The tree is of rapid growth and easily cultivated. It is often grown in avenues and gardens for ornament, but less so than *A. Lebbek.* It yields excellent fuel and charcoal, and is well deserving of cultivation.

234 2. **A. Lebbek,** Benth ; Fl. Br. Ind. ii. 298 ; Bedd. Fl. Syl. t. 53: Trimen Fl. Cey. ii. 128 ; Gamble Man. Tim. 303 ; Brandis Ind. Trees 271. Eng. *The Siris tree.* Tam. *Vágei.* Mal. *Vága.*

Young shoots glabrous, leaf-rachis 7-9 in. long, pinnæ 2-3 pair 5-6 in. long, leaflets 10-18, oblong, obtuse, $1\frac{1}{2}$-2 in. long by $\frac{3}{4}$-1 in. pale beneath, unequal-sided with reticulate venation. Flowers greenish-white, $1\frac{1}{2}$ in. to end of filaments, on slender pedicels 2-4 together forming a short corymbose raceme. Pod 8-12 in by 2 in. straw-coloured, thin shining containing 8-12 compressed seeds.

A large and handsome tree planted in gardens and along road sides in S. Travancore, wild in the deciduous forests at low elevations, being less of a forest tree than the last named. Height 60 ft. Diam 2 ft. Occurs through India, Burmah and Ceylon (rare) also in Tropical Asia.

Flowers March—April. Fruits ripen in Sep—Oct. but they hang on the tree till March. The sound of the ripe pods shaken by the wind is like frying meat, and it is sometimes called the *Fry tree.*

Bark dark grey, rough, with irregular cracks. Wood hard, sapwood large, yellowish-white, heartwood dark brown with paler streaks. Pores large, few, arranged in oblique lines, prominent on a vertical section. Rays fine, distant. Annual rings marked by lines. Gamble gives as an average

W.=47 lbs. P.=820.

The wood varies greatly in weight and strength, but it is very useful, and of late years a considerable quantity of it has been exported to London from the Andamans under the name of "East Indian Walnut". The burrs are especially valuable. The wood seasons, works and polishes well, and is fairly durable, It is used for sugar-cane-crushers, oil-mills, furniture. well-curbs, wheel-work and building (Gamble). This tree like the last is much used in Travancore for small buildings and furniture.

The rate of growth is very fast. Gamble gives 1-3 rings per inch of radius. It is easily raised from seed, but, when grown alone, it requires frequent trimming or it will branch low down. It is planted in S. Travancore in order to afford leaf-manure for paddy fields. "The powdered seeds and the oil extracted from them are used medicinally." (Dict. Econ. Prod.)

3. A. **odoratissima** Benth: Fl. Br. Ind. ii. 299; Bedd. Fl. Syl. t. 54; Trimen Fl. Cey. ii. 129; Gamble Man. Tim. 304; Brandis Ind. Trees 271. Tam. *Karu vágei: chittilei vágei.* Mal. *Puli vága: nelli vága.* 235

Young shoots pubescent, leaf-rachis 4-8 in. pinnæ 3-8 pair, 4 in. long, leaflets 20-40, oblong, apiculate, unequal-sided, glabrous, $\frac{3}{4}$-1 in. by $\frac{1}{4}$ in. Flowers $\frac{1}{2}$ in. to end of filaments, sweet-scented, white, sessile, 2-5 together, arranged in terminal panicles. Pod dark brown 6-8 in. by 1-$1\frac{1}{2}$ in. rough but glabrous, containing 6-12 compressed seeds.

A tree of medium size, common in grass land and open forest through Travancore up to 3000 ft. Renews its foliage in the dry season but is never quite leafless. Height 50 ft. Diameter 1 ft. Occurs also in N. India, the Western Peninsula, Burmah and Ceylon.

Flowers March—June. Fruits Sep.—Dec. hanging long on the tree.

Bark dark grey with brown flakes, $\frac{1}{3}$ in. thick. Wood hard: sapwood white, 2 in. thick; heartwood dark brown with paler streaks, straight-grained, even and smooth, fibre long. Pores medium-sized to large, often divided, prominent on a longitudinal section. Rays very fine, short and indistinct. Annual rings marked by dark lines without pores, 2 to 4 per inch. The wood has been weighed and tested by several persons with varying results. My own experiments gave W=38 lbs. P= 627 but these figures are probably rather low. the specimens having been taken from an immature tree. A good average would be

W=50 lbs. P=750.

"The wood seasons, works and polishes well and is fairly durable. It is used for wheels, oilmills and furniture. It gives a dark brown gum. The leaves and twigs are lopped for cattle-fodder" (Gamble).

The tree is of rapid growth and is well worth attention. Its timber is considered superior to that of *A. Lebbek*, but it does not grow to so large a size as that tree, and it is therefore not so often cut.

4. A. **stipulata**, Boivin; Fl. Br. Ind. ii. 300; Bedd. Fl. Sy. t. 55; Trimen Fl. Cey. ii. 129; Gamble Man. 306 Tim; Brandis Ind. Trees 272. Eng. *The Sau tree Pili vagei: chila vágai.* Mal. *Potta vága.* 236

Young parts golden-pubesent. leaf-rachis 8-14 in. pinnæ 8-15 pair, each $3\frac{1}{2}$-5 in. long, leaflets 50-80, lanceolate, $\frac{3}{4}$ in. long. midrib close to upper margin. Stipules very large, pinkish-orange, unequally cordate, acuminate, soon deciduous. Flowers $1\frac{1}{2}$ in. to end of filaments, on short stalks. in small, lax heads arranged in terminal and axillary panicles, white with pink filaments. Pod 6-8 in. by 1 in. thin, brown rough but glabrous, 8-12 seeded.

A very common tree of the lower open and deciduous forests, ascending the hills to 3000 ft. Height 80 ft. Diameter 2 ft. Found also in Bengal, Burmah, Malaya and Ceylon.

Flowers January—May. Fruits November—December.

Bark smooth, brownish-grey, $\frac{1}{4}$ in. thick. Wood soft: sapwood 3 in. thick; heartwood pale brown, coarse, straight-grained but brittle. Pores large, often divided, plainly visible as short lines on a longitudinal section. Rays faint, very fine and close together. Annual rings marked by darker lines about 2 to the inch of radius.

W=29 lbs. P=666.

The wood is said by Beddome to be used for building and for naves of wheels, and by Kurz and Brandis for furniture and other purposes in Burmah. It has also been used for tea-boxes in Bengal, but it is not considered of any value in Travancore, and is never used except for fuel. My experiments show that the strength of the timber varies greatly "It gives a gum which exudes copiously from the stem and is used by Nepalese for sizing their Daphne paper" (Gamble). It has been extensively planted in the tea plantations of Assam and India under the belief that the amount of nitrogen in the soil is largely increased by it, and that its presence wards off the attacks of insects.

237 5. **A. amara**, Boivin; Fl. Br. Ind. ii. 301; Bedd. Fl. Syl. t. 61; Trimen Fl. Cey. ii. 130; Gamgle Man. Tim. 307; Brandis Ind. Trees 272. Tam. *Unjei: usil.* Mal. *Váráccki.*

Young shoots densely pubescent, leaf-rachis 3-4 in. pinnæ 8-15 pair. 1-$1\frac{1}{2}$ in. long, leaflets 20-60, closely packed, $\frac{1}{4}$ in. long, linear subacute, midrib central. Stipules minute. Flowers $\frac{1}{3}$ in. to end of stamens, pinkish, shortly stacked in dense heads $1\frac{1}{2}$ in. diam. solitary or 2-3 together, ascending from leaf-axils. Pod grey-brown, 4-5 in. by 1 in. very thin, veiny, 6-8-seeded.

A rather small, much-branched tree, confined to the drier parts of Travancore, such as Nagercoil and Aramboli and frequently planted. Height 30 ft. Diameter 1 ft. Occurs also in the W. Peninsula, Vizagapatam and Ceylon.

Flowers April-Aug. Fruits Nov.-Jan.

Gamble says that the wood is very hard, sapwood very large, white; hearwood purplish-brown beautifully mottled, with alternate concentric light and dark bands. Pores moderate-sized, scanty, in patches of soft tissue. Rays very fine, numerous, and he gives.

W=60 lbs.

Skinner says that the "wood is strong, fibrous and stiff, close-grained, hard and durable" and that it is used for beams, carts and agricultural implements. The fuel is excellent and is used on the Railway whenever procurable. This tree is grown in S. Travancore chiefly to supply leaf-manure for the paddy fields, and also as an avenue tree. It is deserving of attention, more especially as its home is in the drier parts of the country, where most trees would not thrive. Reproduction is easy.

A. moluccana is a fast growing tree which is frequently planted on coffee estates as a shade to the coffee.

5. CALLIANDRA, Benth.

Trees with bipinnate or pinnate leaves and few leaflets. Stipules usually persistent, often spincent. Flowers hermaphrodite or unisexual, 3-6-cleft in globose heads. Calyx campanulate. Petals 3-6, united into a funnel-shaped corolla. Stamens indefinite, monadelphous at base, much exserted, not gland-tipped. Pod linear. falcate, sutures much thickened.

C. cynometroides, Bedd; Fl. Br. Ind. ii. 306 (under *Inga cynometroides*); Bedd. Fl. Syl. t. 317; Gamble Man. Tim. 310; Brandis Ind. Trees 273. 238

Leaves pinnate, leaf-rachis about ½ in. leaflets 1 pair, sessile, 3-4 in. by 1-1½ in. narrowly oblong, pointed at both ends. often unequal-sides; stipular spines short, straight. Flowers sessile, ¾ in. to end of stamens, 6-12 together, on axillary peduncles 1-1½ in. long Sepals and petals 3. Pod 4-5 in. by ¾ in. with a hook at the apex containing 5-6 shining, brown seeds.

A middling sized, glabrous tree with thorny branches. found by Beddome in evergreen forests at 2500 ft. elevation near Rosemalei Estate at the head of the Shendoorni Valley, but not observed by any one else.

Flowers and fruits in November.

Beddome says that the timber appears to be very good.

6. PITHECOLOBIUM, Mart.

Trees with bipinnate leaves. Flowers small in globose heads usually bisexual. Calyx campanulate, 5-toothed. Petals 5, united into a funnel-shaped corolla. Stamens indefinite, monadelphous at base, much exserted, not gland-tipped. Pod much twisted when ripe. sutures not thickened.

Branchlets glabrous. Leaflets 1-4 pair ... 1. *P. bigeminum.*
Branchlets covered with rusty tomentum. Leaflets 10-20 pair ... 2. *P. subcoriaceum.*

1. **P. bigeminum**, Benth; Fl. Br. Ind. ii. 303; Bedd. Fl. Syl. xcvi; Trimen Fl. Cey ii. 132; Gamble Man, Tim. 309; Brandis Ind. Trees 274 Tam. *Kal pikku.* Mal. *Muthakolappan: vari kiri: attha perantha.* 239

Young parts glabrous, leaf-rachis 3-6 in. pinnæ 2-3 pair, unequal, lower pair smallest leaflets 2-8, terminal largest, lanceolate, acute, glabrous, 2-5 in. by 1-2 in. Flowers white, $\frac{1}{2}$ in. to end of stamens, in globose heads arranged in open terminal panicles. Pod 3-5 in by $\frac{3}{4}$ in., curved into a ring, twisted when ripe, containing 5-8 black seeds rather larger than a pea.

A small tree of the evergreen forests up to 2000ft. common through Travancore, never exceeding 25 ft. high and 6 in. diameter. Occurs in Assam, the Wynaad, Burmah and Ceylon.

Flowers Jan.-Feb, Fruits June-July.

Bark smooth, brown and thin. Wood light-brown, soft. Pores large, few, often divided. Rays very fine and numerous.

W=22 lbs. (Gamble)

Gamble quoting S. E. Peal says that the "wood is good for planking, battens, &c., but not so easy to work". The wood of our tree is considered very bad, which corresponds with what is said of the Ceylon tree by Trimen.

2. P. subcoriaceum, Thw; Fl. Br. Ind. ii. 305; Bedd. Fl. 240
Syl. t. 189. (Under *P anamallayanum*); Trimen Fl. Bey. ii. 133; Gamble Man. Tim. 302; Brandis Ind. Trees 276. Tam. *Malei vágei.*

Young parts clothed with rusty tomentum, leaf-rachis 2-6 in. pinnæ 4-12, uppermost longest, leaflets 20-50, sessile, oblique, $\frac{1}{3}$-$\frac{1}{2}$ in. long, glabrous above, pilose beneath. Flowers greenish-white, sessile, $\frac{1}{2}$ in. to end of stamens, about 6 together. forming a head 1 in. across, arranged in terminal panicles. Pod 3-4 in. long curved into a circle, orange within containing 4-7 black seeds.

A small tree of the evergreen forests common at all elevations above 4000 ft. such as the High Range, Muthukuli Vayal and Chimunchi. Height 30 ft. Diameter 8 in. Occurs also on the Anamalays and in Ceylon.

Flowers January-March. Fruits June-August.

Trimen says that the wood is "yellowish, light soft and smooth." It does not seem to be used for any purpose.

Two trees may be mentioned here which are often planted in gardens and may sometimes be seen growing wild (1) *P. Saman.* The "Rain tree" of S. America. It was introduced into Celon about 50 years ago as a shade and avenue tree and from thence to Travancore. In good soil it grows very rapidly. but on poor soil the growth is slow. Its timber is light brown, soft and worthless. W=31 lbs. (Gamble). Its pods are edible, and (2) *P. dulce* Tam. *Korakka pillei* indigenous in Central America and introduced as hedge plant into this Presidency. The stem is thorny and, if kept cut down, it makes an impassable hedge. The tree grows fast and yields an excellent fuel. W=40 lbs. (Gamble). The pods are edible and the leaves and twigs are eaten by cattle.

Order XXXIV. ROSACEÆ.

Trees with alternate, simple or compound, stipulate leaves. Flowers regular or irregular, bisexual, rarely unisexual. Calyx gamosepalous lobes 4-6, rarely wanting, deciduous. Stamens perigynous, 10-12 or many. Carpels usually deciduous 1-2 celled with 1 or 2 ovules in each. Fruit fleshy or dry.

An Order of no great importance to the Forest Officer as it contains only 4 trees indigenous in Travancore, but otherwise of great economic value. To it belongs all the species of *Rosa* celebrated for their flowers, the genus *Prunus* including *P. amygdalus* the Almond tree, *P. persica* the Peach and Nectarine, *P. armeniaca* the Apricot, *P. communis* the Plum and Damson, *P Cerasus* the Cherry. *Cydonia vuglaris* the Quince: *Eriobotrya japonica* the Loquat; *Pyrus Malus* the Apple: *P. communis* the Pear, and different species of *Rubus* all cultivated for their fruit, and lastly, *Hagenia abyssinica* which yields the medicinal Kousso.

Ripe carpels not enclosed within the calyx-tube.
  Flowers irregular, bracteolate ... 1. *Parinarium.*
  Flowers regular, without bracteoles ... 2. *Pygeum.*
Ripe carpels enclosed within the calyx-tube ... 3. *Photinia.*

1. PARINARIUM, Juss.

Trees with entire simple leaves, and irregular, bisexual flowers in terminal racemes. 2 or 3 bracteoles at the base of each. Calyx 5-cleft, hairy inside. Petals 5, unequal. Stamens 10-12, much exserted, Carpel free, hairy, 2-celled with 1 ovule in each cell.

P. travancoricum, Bedd; Fl. Br. Ind. ii. 311; Bedd. Fl. 241
Syl. ccxxxviii; Gamble Man. Tim. 311; Brandis Ind, Trees 278.

Young parts covered with silky-grey pubescence, leaves lanceolate, acuminate, glabrous above but midrib silky beneath, reticulate, 3-5 in. by 1 in. stipules narrow. Petiole $\frac{1}{8}$ in. Flowers in erect terminal racemes, 2-4 in. long, pink, $\frac{1}{2}$ in. long. Fruit a brown, ovoid, hard, drupe $1\frac{1}{2}$ in. long and 1 in. diameter, containing a single seed with a ruminated embryo.

An elegant tree of medium size with drooping foliage, rare found by Beddome in evergreeen forests in the Shendroni valley at an elevation of 2000 ft. and by me near Ponmudi in a similar situation. It seems to be peculiar to Travancore. Height 60 ft. Diameter 1 ft.

Flowers Nov.-Dec. Fruits April-June.

Stem cylindrical and straight. Bark smooth, mottled brown and white- $\frac{1}{4}$ in. thick, wood hard. smooth, bright pink when cut, paling with exposure close-grained and even. No heart. Pores medium-sized to large; running in irregular curves, visible as irregular lines on a longitudinal section. Rays very fine, close-packed and faint, crossed by fine, wavy lines of soft tissue. Annual rings not seen.

W=49 lbs. P=803.

2. PYGEUM, Goertn.

Trees with simple, entire leaves, basal glands 2 or 0, stipules minute. Flowers regular, sometimes unisexual,, without bracteoles. Calyx free 5-6-toothed. Petals 5-6, very small, tomentose, equal. Stamens 12-30, filaments slender, spreading. Carpel free, with 2 ovules. Fruit transversely oblong slightly didymous. containing a single seed.

Leaves with 2 basal glands. Calyx-lobes
acute. Stamens 20-30. Ovary glabrous... 1. *P. Wightianum.*
Leaves without glands. Calyx-lobes obtuse.
Stamens 12. Ovary tomentose ... 2. *P. Gardneri*

242 1. **P. Wightianum**, Blume; Fl. Br. Ind. ii. 319; Bedd. Fl. Syl. t. 59 (under *P. ceylanicum*); Trimen Fl. Cey. ii. 134; Gamble Man. Tim 315 Brandis Ind. Trees 282. Tam. *Palán kácchi*: *atta nárei* Mal. *Nai kambagam*: *rettiyam.*

Leaves 3-6 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in. oblong-oval, obtuse, glabrous, with 2 large glands on the midrib near the base. Petiole $\frac{1}{2}$ in. Flowers white, fragrant $\frac{1}{3}$ in. across, about 40-50 together, crowded in racemes 2-3 in. long. Stamens 20-30. Ovary glabrous. Fruit dry, dull green, 1 in by $1\frac{1}{2}$ in.

A handsome dark-leaved tree attaining a height of 80 ft. and a diameter of $2\frac{1}{2}$ ft. common in evergreen forest from 500-4000 ft. Found also in the Anamallays and other hills of S. India and in Ceylon. The fruit, leaves and bark smell strongly of prussic acid.

Flowers July-Aug. and again in Dec. Fruits in Dec. and June.

Bark dark-brown cracked, $\frac{1}{3}$ in. thick, rough Sapwood 3 in. thick, pale. Heartwood pink, even, prettily mottled and streaked, smooth and hard. Pores moderately large to large' numerous, in radial lines unevenly distributed. Rays fine, faint and rather distant. Annual rings marked by larger pores about 7 to the inch.

W. = 44 lbs. P. = 62.

The wood is not used.

243 2. **P. Gardneri**, Hook. f; Fl. Br. Ind. ii. 321; Gamble Man. Tim. 315; Brandis Ind. Trees 282.

Leaves 4-5 in. by 2-3 in. ovate, acuminate. glabrous, without glands. Petiole $\frac{3}{4}$-1 in. Flowers, white, $\frac{1}{4}$ in. across on stout axillary racemes 3-4 in. long. Stamens 12, slender. Ovary tomentose. Fruit 1 in. by $1\frac{1}{2}$ in. dry.

A medium-sized tree of the evergreen forests above 3000 ft. found at Chimunchi, in bud only, rare. Height 40 ft. Diameter 1 ft. Occurs also on the Neilgherries and the Western Ghauts.

Flowers in May.

Nothing is known of the tree or its timber,

3. PHOTINIA, Lindl.

Trees with simple. entire leaves and subulate, deciduous stipules. Flowers small in terminal corymbs without bracteoles. Calyx-tube

adnate to ovary, 5-lobed. Petals 5. Stamens 15-20. Carpel inferior, 2-celled with 2 ascending ovules in each. Fruit a berry-like pome containing 2 seeds.

P. Notoniana, W. and A ; Fl. Br. Ind. ii. 380 ; Bedd. Fl. Syl. 244
t 192 ; Trimen Fl. Cey. ii. 142 ; Gamble Man Tim 324 ; Brandis Ind. Trees 293.

Leaves ovate-oblong, acuminate, glabrous and shining, paler beneath, 4-6 in. by 2-3 in. Petiole 1-1½ in. Flowers pinkish-white, 6 in. across, numerous, in much branched corymbs. Fruit globose, 5 in diameter, red-purple, seeds compressed, pointed at both ends.

A small tree of the evergreen forests, at elevations above 4000 ft. on Muthukuli Vayal and the High Range. Height 20 ft. Diameter 6 in. Occurs also on the hills of S. India, E. Bengal- Burmah and Ceylon.

Flowers Mar-May. Fruits June-August.

Gamble says that the bark is reddish-brown, thin. Wood light-red, hard and close grained. Pores small, uniformly distributed. Rays fine and numerous and he gives

W. = 57 lbs.

The wood is not used.

Order XXXV.—RHIZOPHORACEÆ.

Trees with simple, opposite usually entire leaves, and inter. petiolar, deciduous stipules. Flowers regular, bisexual (rarely polygamous). Calyx adnate to the ovary or free, limb 4-14-lobed, lobes valvate. Petals as many as calyx-lobes, often cut or laciniate. Stamens double the number of petals or more. Ovary inferior or free, 2-5-celled with 2 pendulous ovules in each cell. Fruit usually 1-seeded.

An Order of no great importance to the Forest Officer as only one of the 10 indigenous trees produces good timber of any size. Most of the species are "mangroves" and are of great use in reclaiming land from the tidal backwaters, and the bark of many of them is rich in tannin.

Littoral species. Seed without endosperm, germinating on the tree.
 Petals 4-6. Ovary half-inferior.
  Petals 4, entire. Ovary 2-celled . 1. *Rhizophora*.
  Petals 5, emarginate. Ovary 3-celled . 2. *Ceriops*.
  Petals 5-6, bifid. Ovary 1-celled . 3. *Kandelia*.
 Petals 8-14. Ovary inferior . 4. *Bruguiera*.
Inland species. Seed with endosperm, not germinating on the tree.
 Ovary inferior . 5. *Carallia*.
 Ovary superior.
  Leaves glabrous. Flowers ¾ in. . 6. *Weihea*.
  Leaves pubescent. Flowers ¼ in. . 7. *Blepharistemma*.

1. RHIZOPHORA, Linn.

Evergreen glabrous trees with entire leaves, sending down numerous aerial roots into the mud of backwaters. Flowers in pairs, each supported by 2 thick, fused bracts. Calyx deeply divided, segments 4, enlarged in fruit. Petals 4, entire. Stamens 8-12 with sub-sessile anthers. Ovary half inferior, 2-celled with 2 ovules in each. Fruit conical, leathery, 1-seeded, germinating on the tree.

Flowers on short pedicels: peduncle 1½ in. Stamens 8. . 1. *R. mucronata*
Flowers sessile, peduncle ¼ in. Stamens 11-12 . 2. *R. conjugata*.

245 1. **R. mucronata,** Lam; Fl. Br. Ind. ii. 435; Bedd. Fl. Syl. xcix; Trimen Fl Cey ii. 151; Gamble Man. Tim. 333; Brandis Ind. Trees 303. Mal *Paniccha kandal*.

Leaves 2-5 in. by 1½-4 in. oval, tapering to both ends, terminating in a brown point, ¼ in. long, very fleshy, bright green dotted with red spots. Petiole green, ½-1½ in. Stipules red, 2 in. Flowers usually 2 pairs together, ¾ in. across, calyx buff, petals white, Stamens 8. Fruit 1½-2 in. pendulous, dark brown, sending down a root 18 in. or more long before falling.

A small tree up to 20 ft. high, with a stem 8 in diameter very common along the back waters through Travancore. Also found in similar situations in different parts of India, Burmah and Ceylon.

Flowers April-Sept. Fruits June-Oct.

Bark brown, smooth. Wood extremely hard, heartwood dark-red, sapwood paler. Pores small to medium-sized, often divided, fairly numerous, arranged in bands. Rays fine, numerous and equidistant, giving a silver-grain on a radial section. Gamble gives

$$W = 65 \text{ lbs.}$$

The wood is strong and durable and is not eaten by white ants, but, being of small size, it can only be used for special purposes, such as tool-handles and mallet-heads. The bark is used for tanning in Ceylon and "the fishermen soak their nets in the sap to make them durable." (Trimen).

246 2. **R. conjugata**, Linn; Fl. Br. Ind. ii. 436; Bedd. Fl. Sylxcix; Trimen Fl. Cey. ii. 151 (under *R Candelaria*); Gamble Man. Tam. 332; Brandis Ind. Trees 304. Mal. *Kaya kandal.*

Leaves 3-6 in. by 1½-2 in. ovate-lanceolate, acute at base, tapering to apex, fleshy, bright green, paler beneath. Petiole ¾ in. red. Stipules red, 2-3 in. Flowers ¾ in. across, sessile in pairs, petals white, calyx pale yellow. Stamens 12. Fruit 1 in. germinating like the last,

A small tree similar to *R. mucronata* and found in similar localities. Height 20-25 ft. Diameter 8-10 in. Occurs on the tropical seashores of Asia and Africa.

Flowers Nov.-Feb. Fruits March-August.

The wood is similar and has similar properties to the last. The bark is used for tanning.

2. CERIOPS, Arn.

Small trees sending down aerial roots, with leaves and stipules as in the last, Calyx deeply divided, segments 5. Petals 5, emarginate. Stamens 10, inserted between the lobes of an annular disk. Ovary 3-celled, half-inferior. Fruit as in *Rhizophora*, but the radicle of the germinating embryo ribbed.

C. Candolleana, Arn; Fl. Br. Ind. ii. 436; Bedd. Fl. Syl 247
xcix; Trimen Fl. Cey. ii. 152; Gamble Man. Tim. 333, Brandis Ind. Trees 304. Mal. *An kandal.*

Leaves obovate-oblong, tapering to base, 2-3 in. by 1½-2 in. glabrous, thick, pale green. Flowers white, sessile, ¼ in. across, 3 or 4 together on ¾ in pedicels from the leaf-axils petals tipped with 2 or 3 clavate processes. Fruit 1 in. long, cylindrical, tapering, reddish-brown, ribbed; embryo attaining 10 in.

A small tree common on the backwater about Quilon and other parts. Height 20 ft. Diameter 5 in. Occurs through India and in Ceylon, Andamans and elsewhere.

Flowers and fruits in Oct.-Nov.

" Bark dark-red. Wood orange-red, hard. Pores small scanty,"
" in short radial lines. Medullary rays moderately broad, slightly "
" wavy, uniform and equidistant."

" W=60 lbs." (Gamble).

The wood is a very superior fuel and gives excellent charcoal. It is used elsewhere for boat-building and house-posts. Bark and fruit are used for tanning. Not utilised in Travancore.

3. KANDELIA, Arn.

Small trees sending down aerial roots as in *Rhizophora*. Calyx 5-6-lobed, surrounded by connate bracteoles, Petals 2-fid, the lobes divided into segments, Stamens 20-25. Ovary 1-celled, half-inferior, ovules 6. Fruits ovoid, radicle fusiform.

K. Rheedii, W. and A; Fl. Br. Ind. ii. 437; Bedd. Fl. Syl, 248
c; Gamble Man. Tim. 334; Brandis Ind. Trees 304.

A small tree said by Beddome to be common about the S. Canara and Malabar tidal backwaters, and probably to be found in Travancore, though I have not seen it. Occurs also in Bengal, Andamans, Burma and China.

Bark $\frac{1}{4}$ in. spongy, red-brown. Wood soft, close-grained, reddish-"brown. Pores very small, very numerous. Medullary rays yello-"wish, very short and moderately broad."

"W=36 lbs."

"The wood is used only for firewood. The bark is used in "Tavoy in dyeing red." (Gamble).

4. BRUGUIERA, Lam.

Trees with the habit and leaves of *Rhizophora*. Flowers solitary or few from upper leaf-axils Calyx-tube deeply cut into 8 14 persistent segments. Petals 8-14, bilobed, appendaged Stamens 16-28. Ovary inferior, 2-4 celled with 2 ovules in each cell. Fruit imbedded in the Calyx-tube, afterwards protruding, 1 seeded. Radicle of embryo cylindrical

Flowers solitary : calyx-segments 10 14.
  Petals glabrous except at the bas .. 1. *B. gymnorhiza*.
  Petals densely hirsute from base to apex .. 1. *B. eriopetala*.
Flowers in threes: calyx-segments 8 .. 3. *B. caryophylloides*.

1. **B. gymnorhiza**, Lam : Fl. Br. Ind. ii. 437 ; Bedd. Fl. Syl. c ; Trimen Fl. Cey. ii. 153 ; Gamble Man. Tim. 334 ; Brandis Ind. Trees. 305, Mal. *Kandal*. 249

Leaves $3\frac{1}{2}$-6 in. by 2-4 in. oval, tapering to both ends, bright green, thick and glabrous. Petiole 1 in. Flowers white, solitary, drooping, 1 in across. on $\frac{1}{2}$ in. peduncles Calyx segments linear, erect, $\frac{1}{2}$-$\frac{3}{4}$ in. they and petals 10-14, the latter 2 lobed with 2 bristles on each lobe, Stamens 20-28 Fruit 1 in long, green with the scarlet calyx attached, embryo 6 in 1 ft. long, angled.

A small tree very common on the backwaters about Quilon, this species and the two *Rhizophoras* forming the majority of the "mangroves" seen there Height 30 ft. Diameter 6 in. Occurs also throughout India, Burma and Ceylon.

Flowers and fruits from June—Oct.

Gamble describes the wood as red, extremely hard Pores small, oval, and subdivided. Medullary rays moderately broad, fine, very numerous, and he gives.

W=54 lbs.

"The wood is used for firewood, house-posts, planks and articles of native furniture." (Gamble).

2. **B. eriopetala**, W. and A., Fl. Br. Ind. ii. 438 ; Bedd. Fl. Syl. ci. (under *B. cylindrica*) ; Gamble Man. Tim. 334 ; Brandis Ind. Trees 305. 250

A small tree, similar to the last, except that the petals are "densely hirsute along the edges from base to apex with silvery hairs." (Brandis) and that the calyx-segments are longer (1 in.) and exceed the fruit. It has been found at Quilon, but I have not observed it. Occurs also in Malabar and the Malay Peninsula and Archipelago.

The timber has not been examined.

3. **B. caryophylloides**, Blume; Fl. Br. Ind. ii. 438; Bedd. Fl. Syl. ci; Trimen Fl. Cey. ii. 154; Gamble Man. Tim. 334; Brandis Ind. Trees 305. (includes *B. malabarica*). 251

Leaves 3-4 in. by $1\frac{1}{2}$-3 in. lanceolate-oval, tapering to base, acuminate, glabrous, rather thin. Petiole $\frac{3}{4}$ 1 in. Flowers small, white, in 2-3 flowered cymes, on slender peduncles $\frac{3}{8}$ in. long. Calyx segments 8, reflexed in fruit, $\frac{1}{4}$ in. long. Petals 8, hairy outside, deeply bifid with several bristles at the end of each lobe. Stamens 16. Fruit $\frac{1}{2}$ in. long, smooth, embryo attaining 6 in. slender, cylindrical.

A small tree found in company with other "mangroves" on our backwaters, also in Ceylon, Tennasserim, Malay Peninsula and Archipelago. Not known to me.

Its timber is unknown.

5. CARALLIA, Roxb.

Evergreen trees with glabrous leaves and sessile flowers in axillary cymes. Calyx-tube campanulate, connate with the ovary, segments 4-8, valvate. Petals 4-8 fimbriate. Stamens 8-16, inserted on the edge of an annular disk. Ovary inferior, 4-celled with 2 ovules in each cell. Fruit fleshy, 1-seeded.

C. lucida, DC.; Fl. Br. Ind. ii. 439; Bedd. Fl. Syl. t. 193; Trimen Fl. Cey. ii. 155; Gamble man. Tim. 335. (under *C. integerrima*) Mal. *Varanga*: *valovam*. 'valogam : valokkam.' 252

Leaves $3\frac{1}{2}$-$4\frac{1}{2}$ in. by $2\frac{1}{2}$-$3\frac{1}{2}$ in. obovate-oval, rounded at the apex, entire or serrulate at the tip margin somewhat revolute, very coriaceous. Petiole $\frac{1}{4}$ in. Stipules $\frac{3}{4}$ in. Flowers white $\frac{1}{4}$ in. across, in trichotomous cymes. Fruit $\frac{1}{4}$ in. diameter, berry-like, smooth, red; seed with a thick orange testa.

A handsome dark-foliaged tree with wide-spreading horizontal branches, common in all the evergreen forests of Travancore from 0-4000 ft. and often planted for ornament. In damp situations it throws out thin, aerial roots. Height 100 ft. Diameter $2\frac{1}{2}$ ft. Occurs also in many parts of India chiefly to the South and East, in Burmah, Malaya and Ceylon.

Flowers Dec.—Feb. Fruits March—April.

Bark dark grey, $\frac{1}{2}$ in. thick. Wood hard, orange, evengrained and prettily mottled. Sapwood pale and bad. Pores medium-sized and large, often divided. Rays of two kinds very broad and visible to the naked eye, and very narrow and indistinct, crossed by wavy lines and bands of dark and light tissue. Annual rings indistinct.

W=47 lbs. P=700.

"The wood is very handsome and useful for furniture and 'cabinet-making, especially when cut so as to show the beautiful 'silver grain to advantage' (Gamble). It is sometimes felled in Travancore, but it deserves more notice than it receives. It is said to be brittle and not lasting, and, under exposure, this may be true. It splits easily and has been used for shingles. The wood may easily be distinguished by its broad medullary rays.

6. WEIHEA, Spreng.

Small trees with entire leaves and few, axillary flowers. Calyx free, cut nearly to the base into 5 silky segments. Petals 5, much cut. Stamens about 30, hypogynous. Ovary free, 3,-celled with 2 ovules in each cell. Fruit a fleshy capsule with 4-6 seeds.

W. zeylanica, Baill ; Fl. Br. Ind. ii. 440 ; Bedd. Fl. Syl. t. 194 ; 253
Trimen Fl. Cey. ii. 156 ; Gamble Man. Tim 336 ; Brandis Ind. Trees 306.

Leaves 2-3½ in. by 1½—2½ in. broadly oval, acuminate, glabrous and shining above, bright apple-green. Petiole ⅓ in. Stipules small, acute, ciliate. Flowers white ¾ in on short stalks, solitary or 2-3 together, enclosed in 2 rounded bracts. Fruit globose, splitting into 3 valves.

A small tree not seen by me, but said by Beddome to be "not uncommon in the S. Travancore and Tinnevelly mountains at no great elevation, also in Ceylon."

Flowers in September.

The wood is not known.

7. BLEPHARISTEMMA. Wall.

Trees with membraneous, crenate leaves and small stipules. Flowers polygamous in axillary cymes, Calyx-tube ovoid with 4 minute teeth. Petals 4, clawed, tips laciniate. Stamens 8, inserted on the margin of the disk. Ovary 3-celled, free. Fruit a fleshy capsule.

B. corymbosum, Wall ; Fl. Br. Ind. ii. 441 ; Bedd. Fl. Syl. ci ; 254
Gamble Man. Tim. 336 ; Brandis Ind. Trees 306. Mal *Nir kurunda*.

Young shoots pubescent. Leaves 3-5 in. by 1½-2 in. ovate soft, veins strongly marked. Flowers white ¼ in. across, fragrant, numerous. Fruit greenish-black ¼ in. diam.

A handsome straight-stemmed tree, generally of small size, but under favorable circumstances and in evergreen forest attaining a height of 100 ft. and a diameter of 2 ft. Common all over the low country of N. Travancore and found also in Central and S. Travancore. Confined to the W. Peninsula.

Flowers March-April. Fruits May-June.

Wood pale greyish-yellow, straight-grained, rather rough, moderately hard, splits easily. No heart. Pores evenly distributed, small and very numerous. Rays, very fine, indistinct, crossed by wavy bands of different coloured tissues. Annual rings indistinct.

W = 42 lbs. P = 574.

The wood is not used and it is said to be brittle, but it is not bored by beetles.

ORDER XXXVI. COMBRETACEÆ.

Trees with alternate or opposite, simple entire leaves without stipules. Flowers bracteate, usually sessile, bisexual rarely polygamous. Calyx-tuble adnate to ovary and produced beyond it, 4-5 lobed, segments valvate. Petals o or 4-5, Stamens 8 or 10, inserted on the calyx tube. Ovary inferior, 1-celled with 2-5 pendulous ovules. Fruit indehiscent, dry or fleshy, 1 seeded.

A very important Order containing 9 trees most of them of large size and many yielding useful timber.

Flowers in spikes.	
Petals 0. Large trees	1. *Terminalia.*
Petals 4-5. Small trees	2. *Lumnitzera.*
Flowers in globose heads	3. *Anogeissus.*

1. TERMINALIA, Linn.

Large trees with alternate or nearly opposite leaves. Flowers small, sessile, in axillary or terminal panciculate spikes. Calyx-tube constricted above the ovary, 4-5 lobed, segments valvate. Petals o. Stamens 8-10 in 2 rows, Ovary 1-celled with 2-3 ovules in each. Fruit an indehiscent drupe, or dry and winged.

Fruit fleshy, not winged.	
Spikes simple. Flowers polygamous. Leaves clustered at ends of branches.	
Fruit compressed, showing 2 sharp edges .	1. *T. Catappa.*
Fruit ovoid, without edges . .	2. *T. belerica.*
Spikes branched. Flowers bisexual. Leaves not clustered.	
Bark dark-brown, deeply cracked .	3. *T. chebula.*
Bark greenish-buff, smooth . .	4. *T. travancorensis.*
Fruit dry, winged	
Wings 5, equal	
Bark black, deeply cracked . .	5. *T. tomentosa.*
Bark greenish-buff, smooth . .	6. *T. Arjuna.*
Wings 3, unequal . .	7. *T. paniculata.*

255 1. **T Catappa,** Linn: Fl. Br. Ind. ii. 444; Bedd. Fl Syl. t. 20; Gamble Man. Tim. 337; Brandis Ind. Trees 307. Eng. *The Indian Almond tree.* Mal. *Thalli thenga.*

Leaves alternate, clustered at the ends of the branches, glabrous, obovate from a narrow, cordate base, pale green turning bright red before falling, 6-12 in. by $2\frac{1}{2}$-6 in. Petiole $\frac{1}{2}$ in. Flowers white, $\frac{1}{4}$ in. across, in slender, axillary spikes. Fruit pale-green, glabrous, ellipsoid but much compressed, keeled all round, about 2 in. long.

A fast-growing tree not indigenous in Travancore but naturalised and commonly seen on the banks of canals. Planted in gardens and avenues. Height 50 ft. Diameter 1 ft. Native of the Andamans and Malay Peninsula.

Flowers in February—May and again in October—November Fruits January and July.

Gamble says that the wood is red and hard with lighter-coloured rapwood. Pores moderate-sized, scanty, joined by wavy bands of soft texture. Rays fine, and he gives as an average.

W = 36 lbs. P = 470.

The timber does not seem to be used in any way. The kernels of the nuts are eaten, and an oil may be expressed from them. "The bark and leaves give a black dye. It is one of the trees on which the Tasar silkworm is fed." (Gamble).

256 2. **T. belerica**, Roxb ; Fl. Br. Ind. ii. 445 ; Bedd. Fl. Syl. t. 19 ; Trimen Fl. Cey. ii. 159 ; Gamble Man. Tim. 337. Tam. and Mal. *Thini*.

Leaves 4-9 in. by $2\frac{1}{2}$-$4\frac{1}{2}$ in. obovate-oval, crowded at the ends of the branches, puberulous when young, glabrous when old. Petiole $\frac{1}{2}$-3 in. Flowers greenish-yellow, strong-scented, $\frac{1}{4}$ in. across, in spikes 2-3 in. long. Fruit ovoid or pyriform, yellowish-brown, stone large, woody, obscurely angled.

A very lofty tree with a straight, unbranched stem very common in the deciduous forests at low elevations through Travancore. Height 120 ft. Diameter $3\frac{1}{2}$ ft. Occurs through India, Burmah and Ceylon except in the very driest regions.

Flowers February—April just as the young foliage is appearing. Fruits ripen in November but hang on the tree till the old leaves drop off.

Bark rather smooth, greyish-black, $\frac{1}{2}$ in. thick. Wood yellowish-grey, straight grained, rather coarse, hard. Pores medium-sized and large, often divided, dispersed through narrow, wavy bands of soft tissue.

Rays numerous, very fine, uniform and equidistant. Annual rings indistinct.

W = 42 lbs. P = 720.

The wood is very little used in Travancore. It has been tried for dug-out boats for which purpose its size and straightness should make it very suitable, but the wood is not durable and it is often damaged by insects. In other parts of India the wood is used for coarse planking, packing-cases; canoes and for house-building, after steeping it in water which renders it more durable. It is likely that when wood-preservatives are more largely employed this timber will be more generally used. The tree grows fast. Gamble gives 3-7 rings per inch of radius. The most useful part of the tree is its fruit, which forms one of the "myrabolans" of commerce. It is used for dyeing cloth and leather, and in tanning, but, according to Gamble, it is hardly worth the cost of collection and carriage. It is collected by the natives and used locally in medicine and for house-hold purposes.

257 3. **T. Chebula**, Retz ; Fl. Br. Ind. ii. 446 ; Bedd. Fl. Syl. t. 27 ; Trimen Fl. Cey. ii. 159 ; Gamble Man. Tim. 338 ; Brandis Ind. Trees 308. Eng. The *Gallnut tree*. Tam. and Mal. *Kadukkai*.

Leaves 3-6 in. by $1\frac{1}{2}$-3 in. oval-oblong, rounded at the base, obtuse, pubescent on both sides. Petiole $\frac{1}{2}$-1 in. with 2 glands just below the blade. Flowers $\frac{1}{4}$ in. across, strong-scented, greenish-white in terminal

spikes 3 in. long. Fruit broadly ovoid, glabrous, greenish-yellow $1\frac{1}{2}$ in. long, stone large, woody, obscurely angled.

A tree of moderate size common in the dry deciduous forests of S. Travancore, as well as on the Cardamom Hills and the High Range, ascending to 6000 ft always where the rainfall is light, absent from the wetter districts. Height 50 ft. Diameter $1\frac{1}{2}$ ft. Occurs through India and in Ceylon.

Flowers March—April with the new leaves Fruits ripen from November—January.

Bark dark-brown, cracked, $\frac{1}{4}$ in thick. Wood very hard, brownish-grey with a small dark purple heartwood, close-grained. Pores small and moderate-sized, often divided. Rays very fine, numerous and uniform, Annual rings indistinct Gamble gives as an average.

W = 64 lbs. P = 966.

"The wood takes a good polish and is fairly durable; it is used for furniture, carts, agricultural implements and house-building. Beddome says that it is cross-grained and difficult to work. The bark is used for tanning and dyeing" (Gamble). Neither wood nor bark seem to be used in Travancore, as many other better timbers are available. The fruit is the black myrabolan of commerce, and it is superior to the beleric myrabolan of the tree last described. Gamble mentions that the Indian exports of these myrabolans amount to about 40,000 tons a year,valued at over 30 lakhs of rupees, and that in the Southern Circle of Bombay the Forest Department make a profit of at least 50,000 Rs. a year from this source alone. The fruits treated with alum give a yellow dye. The value of the fruit is well known in Travancore, but the tree occurs only over limited areas, and the quantity exported (chiefly from the Cardamom Hills) is not large, though it is used locally, to a considerable extent, to mix with mortar in house-building. The growth is moderate, 6-10 rings per inch of radius.

258 4. **T. travancorensis**, W and A; Fl Br Ind ii 449; Journal Bombay Nat, Hist. Soc xii. 351 (under *T angustifolia*); Gamble Man. Tim. 340; Brandis Ind. Trees 308. Tam. *Pei kadukkai* Mal. *Katta kadukkai*; *chúla maruthu*.

Leaves alternate and sub-opposite. 2-4 in. by $1\text{-}1\frac{1}{4}$ in. ovate-lanceolate, glabrous. Petiole $\frac{1}{2}\text{-}\frac{3}{4}$ in. without glands. Flowers $\frac{1}{6}$ in. across, white, in terminal and axillary spikes. Fruit ovoid, yellowish-brown covered with lenticels, $\frac{3}{4}\text{-}1\frac{1}{2}$ in. long Stone 5-angled.

A very large forest tree with a smooth, yellowish bark and erect, trunk, fairly common in the evergreen forests of N. and S. Travancore and ascending the hills to 2000 ft Height 100 ft. Diameter $2\frac{1}{2}$ ft. Endemic.

Flowers in May—June. Fruit November—January.

Bark pale brown, smooth, $\frac{1}{4}$ in. thick. Sapwood yellowish-white. Heartwood pale brown, hard, with a straight grain and long fibre. Pores small and medium-sized, numerous and evenly distributed. Rays very fine, very numerous, indistinct. Annual rings marked by darker lines 8-10 to inch.

W = 51 lbs. P = 1012.

The wood of this tree does not seem to be used. but, it has all the appearance of a sound, useful timber.

259 5. **T. tomentosa**, W. and A; Fl. Br. Ind. ii. 447; Bedd Fl. Syl. t. 17; Gamble Man Tim. 341; Brandis Ind. Trees 310. Tam. *Karu maruthu.* Mal. *Thembavu: koro maruthu.*

Leaves sub-opposite, oblong, 5-9 in. by $2\frac{1}{2}$-4 in. coriaceous, glabrous above, beneath softly tomentose, 1-2 glands near base of midrib. Petiole $\frac{1}{4}$-$\frac{1}{2}$ in. Flowers bisexual, $\frac{1}{8}$ in. across, dull yellow, in erect terminal panicles 3-6 in. long. Fruit ovoid $1\frac{1}{2}$-2 in. long, with 5 equal, coriaceous, brown wings nearly 1 in. broad, marked with horizontal lines.

A very large deciduous tree with a straight, cylindrical stem and deeply cracked black bark. very common through Travancore between sea level and 2000 ft. Height 100 ft. Diameter 3 ft. Found all through India (except in the arid region) and in Burmah, but not in Ceylon.

New leaves appear in March—April. Flowers in May. Fruits November—January.

Bark 1 in. thick, greyish-black, sapwood reddish-white, heartwood dark brown streaked with black and darker shades of brown, the streaks showing as long black lines on a longitudinal section, hard coarse. Pores medium-sized to large uniformly distributed but much larger in the spring, wood often crossed by wavy bands of soft tissue. Rays very fine, numerous and uniform. Annual rings indistinct, about 6 to inch.

W = 65 lbs P = 808.

The timber of this tree is very largely used by all sections of the people of Travancore for house-building. carts and furniture, but it is difficult to work, and its strength and durability are uncertain Sometimes beams will last well and will support heavy weights, at others they will decay rapidly. Battens cut from the same piece of wood will sustain very different weights. It has been tried for Railway-sleepers, but many Companies refuse to accept the wood for the above reasons. The wood splits unless thoroughbly seasoned. It is an excellent fuel and makes good charcoal.

Gamble mentions that the bark is used for tanning and for dyeing black, and " the ashes of the bark gives a kind of lime which is eaten by the natives. The tasar silkworm feeds on its leaves, and lac is occassionally gathered from its branches. It gives a brown gum."

"The tree is easily cultivated, reproduces very well and coppices freely." (Gamble). Trees measured by me showed an average annual growth in height of 5 ft, and in girth of $3\frac{1}{2}$ in. over a period of 10 years, say 2 rings per inch of radius, but this is exceptionally fast.

The quantity of thembavu felled every year in Travancore is about 9,000 candies (1,44,000 cub. ft.) and it stands third as regards quantity sold. Its present value in logs delivered on the coast is 12-14 as. per cub. ft.

6. **T. Arjuna**, Bedd ; Fl. Br. Ind. ii. 447 ; Bedd. Fl. Syl. t. 28 ; Trimen Fl. Cey. ii. 160 (under *T. glabra*) ; Gamble Man. Tim. 341 ; Brandis Ind. Trees 311. Tam. *Kuli maruthu*. 260

Leaves sub-opposite, oblong, rounded at both ends, often crenulate, glabrous on both sides, 3-6 in. by $1\frac{1}{2}$-3 in. Petiole $\frac{1}{4}$ in. with 1 or 2 glands just beneath the leaves. Flowers $\frac{1}{8}$ in. across, dull yellow, in short lax spikes or small panicles, honey scented. Fruit ovoid, 1 in. long, with 5-7 narrow wings $\frac{1}{4}$ in. broad.

A very large tree with a thick, often buttressed, trunk and smooth greenish-buff bark flaking off in thin layers, very rare in Travancore in a wild state, probably not indigenous. Confined to the Shencottah taluk and the Anjinaud Valley where it is planted as an avenue tree. It is sometimes found growing on the banks of streams and tanks. Height 80 ft. Diameter 5 ft. Occurs also in Central and Southern India, Burmah and Ceylon in the drier districts only.

New leaves appear in Feb.—March, Flowers April—May. Fruit ripens Nov.—Jan.

Gamble thus describes the wood and its uses "Bark $\frac{1}{3}$ in." "thick, smooth, pinkish grey. Sapwood reddish-white ; heartwood" "brown, variegated with darker-coloured streaks, very hard. Annual" "rings, doubtful. Pores moderate-sized and large, sometimes very" "large, uniformly distributed, more numerous and larger than in *T.*" "*tomentosa*, often divided, each pore surrounded by a ring of soft" "tissue. Numerous thin, wavy lines which frequently anastomoze." "Medullary rays very fine very numerous."

W=59 lbs. P=813.

"The wood is apt to split in seasoning and is not easy to work." "It is used for carts, agricultural implements, boats and for build-" "ing. It gives a brown transparent gum. The bark is used as a" "tonic to heal wounds."

"It is easily propagated from seed, and the seed germinates well in a natural state reproducing in profusion."

7. **T. paniculata**, W. and A ; Fl. Br. Ind. ii, 448 ; Bedd. Fl. Syl. t. 20 ; Gamble Man. Tim. 344 ; Brandis Ind. Trees 311. Tam. *Vem-maruthu* : *velli maruthu*. Mal. *Maruthu* : *pei maruthu* : *pillei maruthu*. 261

Leaves 4-7 in. by 2-$2\frac{1}{2}$ in. glabrous, oblong, base rounded, upper leaves always alternate, lower sometimes opposite. Petiole $\frac{1}{4}$-$\frac{1}{2}$ in. Flowers white $\frac{1}{3}$ in across, in ample rusty-pubescent panicles, terminal and axillary. Fruit $\frac{1}{4}$-$\frac{1}{2}$ in. long, brownish-red, with one large and two smaller lateral wings.

A large tree probably the commonest tree in Travancore, often forming 50-60 per cent of the trees in the deciduous forests between 0-2000 ft. Height 90 ft. Diameter 3 ft. Occurs also in Malabar and S. India, not in Burmah and Ceylon.

Flowers July-Dec., one flowering succeeding another. Fruit Nov.-Feb.

Bark $\frac{1}{2}$ in. thick, dark brown cracked. Wood pale brown, smooth even and close grained, prettily mottled, very hard. Pores medium-sized and large oval, often divided, connected by wavy lines of soft tissue. Rays fine, numerous, equidistant. Annual rings indistinct.

W=57 lbs. P=636

The wood is good but not equal to that of *T. tomentosa*. It has the same fault of uncertainity. It is improved by being kept under water. It makes good planking and building-timber, if well-seasoned, and, though it has not been much employed hitherto it is now coming much more into use because of its cheapness. The present value is 6 to 8 annas per cub. ft. in log.

The tree grows fast and reproduces itself readily.

2. LUMNITZERA, Willd.

Small trees with alternate, fleshy, exstipulate leaves clustered about the ends of the branches. Flowers bisexual in axillary spikes. Calyx-tube much produced, with 2 adnate bracteoles near the base, limb 5-parted. Petals 5, small, stamens 10. Ovary inferior, 1-celled with 2-5 pendulous ovules. Fruit indehiscent, seed one.

262 **L. racemosa**, Willd; Fl. Br. Ind. ii. 452; Bedd. Fl. Syl. cili; Trimen Fl. Cey. ii. 162; Gamble Man. Tim. 348; Brandis Ind. Tr. 314.

Leaves 2-3 in. by $\frac{1}{2}$ in. spathulate-oblong, tapering to base, rounded at apex, crenate, shining, pale green and fleshy. Petiole 0, Flowers white. $\frac{1}{3}$ in. across, about 10 together in erect 2 in. spikes. Fruit ovoid, compressed $\frac{1}{2}$-$\frac{3}{4}$ inch.

A small tree found on the backwaters in company with "mangroves." Sometimes attains a height of 40 ft (Brandis). Occurs also on the coasts of India, Burmah and Ceylon.

Flowers and fruits March to July.

Gamble says that the "bark is $\frac{1}{4}$ in. thick, brown, hard, rough," "wood greyish-brown with a small darker heartwood, hard. Pores" "small, uniformly distributed, often subdivided or in short radial" "lines. Medullary rays fine, numerous" and he gives

W=54 lbs.

"The wood is strong and durable, and is used for house-posts and as fuel. The vertical sections often show a satiny water-marking" (Gamble). It is not used in Travancore.

3. ANOGEISSUS, Wall.

Trees with alternate, exstipulate leaves, and bisexual flowers in globose heads. Calyx with a long tube extending above the ovary, limb campanulate, 5-parted. Petals 0 Stamens 10 in 2 rows. Ovary inferior, compressed, 1-celled, with 2 pendulous ovules. Fruit indehiscent 2-winged, terminating in a beak. Seed solitary.

263 **A. latifolia**, Wall; Fl. Br. Ind. ii. 450; Bedd. Fl. Syl. t. 15; Trimen Fl. Cey ii. 162; Gamble Man. Tim. 346; Brandis Ind. T. 315. Tam. *Vekkali.* Mal. *Maru kinchiram.*

Leaves $1\frac{1}{2}$-3 in. by 1-2 in. broadly oblong, margin undulate, pubescent and pink when young glabrous and dull green when full grown. Petiole $\frac{1}{4}$ in. Flowers pale green, $\frac{1}{4}$ in. across, sessile in globose heads, about 16 together. Fruit $\frac{1}{3}$ in. across, flattened, nearly circular, bright brown.

A large tree, very abundant in parts of S. Travancore, on the Cardamom Hills and elsewhere in the drier deciduous forests between 0-4000 ft. always avoiding the wetter parts of the country. Height 60 ft. Diameter 2 ft. Occurs throughout India and in the drier parts of Ceylon.

Flowers Dec.-Jan. and June–July. Fruits Jan.—Feb. and July–Aug.

Bark $\frac{1}{4}$ in. thick, pale brown mottled with white, smooth. Sapwood in young trees yellowish white: wood in older trees yellowish grey, hard, shining, coarse, with a very hard dark purple centre of small size and irregular shape. Pores small and very numerous, often divided, surrounded by patches of pale tissue which often form wavy lines connecting them. Rays extremely fine, numerous and equidistant. Annual rings marked by darker lines without pores.

W=60 lbs. P=857.

"The wood is highly valued on account of its great strength and toughness, but it splits in seasoning and unless kept dry is not very durable. It is used for axe-handles, poles for carrying loads, axles of carts, in the construction of furniture, for agricultural implements and in ship-building." (Gamble). It produces excellent charcoal and is a good fuel, and for these purposes it is largely cut is S. Travancore, but the small size of the trees which grow on the dry slopes precludes its being used except for bandy poles and agricultural implements. It yields a gum much used in other parts of India for cloth printing, and the leaves are employed for tanning.

It reproduces itself well from seed, and deserves attention, as in the places where it occurs, it clothes dry slopes where other trees do not thrive. The rate of growth is moderate, 7 rings per inch of radius.

ORDER XXXVII. MYRTACEÆ.

Trees with simple, generally entire, opposite or alternate leaves. Flowers regular, bisexual, calyx-tube adnate to ovary and sometimes produced beyond it, segments 4 or 5, usually persistent. Petals 4 or 5, free or calyptrate, imbricate. Stamens numerous, epigynous. Ovary inferior, 2-4-celled with many ovules. Fruit fleshy or dry.

An Order of great importance containing 25 indigenous trees, most of them with hard timber. To it belongs the Australian genus *Eucalyptus* which includes about 150 species, many of which have been introduced into India and thrive at different elevations. The

most important are *E. globulus* the Blue gum *E. diversicolor* the Karri, *E. leucoxylon* the Iron bark or White gum, *E. rostrata* the Red gum, *E marginata* the Jarrah, *E. obliqua* the Stringy bark and *E. robusta* the Swamp mahogany. The Guava tree *Psidium Guayava* from Tropical America, *Melaleuca minor* from the Moluccas yielding Cajeput oil, *Eugenia Pimenta* the Allspice from the West Indies, *E caryophyllata* the Clove from the Moluccas, and the different species of Myrtle belong to this Order.

Leaves opposite, gland-dotted. Stamens distinct . 1. *Eugenia*.
Leaves alternate, not gland dotted. Stamens connate below.
 All stamens fertile. Seed solitary . 2. *Barringtonia*.
 Some stamens without anthers. Seeds many 3. *Careya*.

1. EUGENIA, Linn.

Trees with opposite, entire, gland-dotted leaves having an intramarginal vein. Flowers usually tetramerous, in terminal, axillary or lateral cymes, or solitary. Calyx tube usually produced beyond the ovary, forming a cup. Petals free or calyptrate. Stamens in several series, distinct. Ovary 2-(or 4-) celled. Fruit a berry with 1 or few seeds.

Flowers usually in cymes. Calyx tube produced beyond ovary, free portion cup-shaped.
Petals large, distinct: calyx with large staminal disk. Fruit over 3/4 in
 Leaves rounded or cordate at base.
Flowers in terminal cymes.
 Leaves acuminate, not more than 2 1/2 in. broad. Calyx tube turbinate . 1. *E. Munronii*.
 Leaves obtuse, exceeding 2 1/2 in. broad. Calyx-tube hemispherical . 2. *E. Mundajom*.
 Flowers lateral on the old wood . 3. *E. Rama Varma*.
Leaves narrowed to the base.
 Leaves ovate-lanceolate, exceeding 1 in. broad.
 Calyx-tube cylindrical . 4. *E. læta*.
 Calyx tube hemispherical . 5. *E. hemispherica*.
 Leaves linear, less than 1 in. broad 6. *E. occidentalis*.
Petals small, usually combined and falling off as a cap (calyptrate), no staminal disk. Fruit less than 3/4 in. diam.
 Cymes in axils of fallen leaves . 7. *E. Jambolana*.
 Cymes terminal or axillary
 Calyx-tube long, funnel shaped.
 Fruit ovoid-turbinate, scarlet . 8. *E. Wightiana*.
 Fruit globose, white . 9. *E. zeylanica*.
 Calyx-tube short, cup-shaped or turbinate.
 Branchlets quadrangular.
 Leaves under 2 in. broad, acuminate . 10. *E. rubicunda*.
 Leaves over 2 in. broad, obtuse . 11. *E. montana*.
Branchlets terete or compressed.
 Leaves petiolate.
 Leaves ovate lanceolate, tapering to both ends . 12. *E. Gardneri*.
 Leaves obovate tapering to base . 13. *E. corymbosa*.
 Leaves rounded at base, tapering to apex . 14. *E. Arnottiana*.
 Leaves rounded at both ends or shortly acuminate . 15. *E. Chavarax*.

Leaves sessile or subsessile.
Leaves oblong under $\frac{1}{2}$ in. by $\frac{1}{4}$ in. . 16. *E. microphylla.*
Leaves oblanceolate, over 3/4 in. by $\frac{1}{3}$ in. . 17. *E. Myhendræ.*
Leaves orbicular, over 1 1/2 in. by $1\frac{1}{4}$ in. . 18. *E. cyclophylla.*
Flowers solitary or fasciculate. Calyx-tube not produced beyond ovary, petals distinct.
Young shoots and inflorescence pubescent
Pedicels longer than calyx-tube.
Leaves dark green, over 3/4 in. broad . 19. *E. bracteata.*
Leaves copper-brown, under 3/4 in. broad . 20. *E. Rottleriana.*
Pedicels very short or 0 . 21. *E. codyensis.*
Young shoots and inflorescence glabrous . 22. *E. Mooniana.*

1. **E. Munronii,** Wight; Fl. Br. Ind. ii. 472; Bedd. Fl. Syl. cix; Gamble Man. Tim. 356; Brandis Ind. Tr. 318. 264

Branches 4-angled. Leaves 5-10 in. by $1\text{-}2\frac{1}{2}$ in. glabrous, lanceolate, accuminate, base cordate, nerves prominent beneath, joined by a thick, intra-marginal vein. Petiole $\frac{1}{6}$ in. Flowers white or dark pink, $1\frac{1}{2}$ in. across, 6 12 together in drooping, terminal cymes. Calyx-tube tapering into the pedicel. Style long, slender. Fruit greenish-pink, $1\frac{1}{2}$ in. long.

A small tree of the evergreen forests of Peermerd and S. Travancore between 2000 and 5000 ft, not uncommon. Height 30 ft. Diam. 8 in. Occurs also on the Western Ghauts and the Neilgherries.

Flowers Jan.-Mar. Fruits April-May.

Nothing is known of the tree or its timber. It might be planted for ornament.

2. **E. Mundagam,** Bourdillon; Brandis Ind. Trees 318. Tam. *Kátta sámba.* Mal. *Mundagam.* 265

Branches terete. Leaves 6-12 in. by $2\frac{1}{2}$-5 in. glabrous, pink when young, at length dark green, oblong, obtuse, base cordate, nerves prominent beneath. Petiole $\frac{1}{4}$ in. Flowers white, 1 in. across, 30-60 together in large erect, terminal cymes, fragrant, calyx-tube rounded. Style short, stout. Fruit ovoid, greenish-pink, 1 in. long.

A medium-sized tree common in the evergreen forests from 0-4000 ft. Height 50 ft. Diam. $1\frac{1}{2}$ ft. Endemic.

Flowers April-May. Fruits June-July.

Bark smooth, brown, $\frac{1}{3}$ in. thick, Wood greyish to reddish brown, rough and coarse, hard, darker in the centre, Pores very small, numerous and evenly distributed. Rays very fine, indistinct, crossed by wavy hands. Annual rings not seen.

W = 41 lbs. P. = 675

The wood is not known and the tree is of too small a size to yield good timber, but young trees are sometimes used as posts for huts. The tree is very ornamental, especially when covered with its ivory-like buds and white flowers. It deserves cultivation.

3. **E. Rama Varma,** Bourdillon; Ind. For. xxx 147; Brandis Ind. Tr. 318. 266

Leaves 4·7 in. by 2·3 in, in. base cordate, gradually narrowing into a long acumen. secondary nerves (15-20 pairs) and intra marginal nerve all distinct. Petiole very stout, ¼ in. Flowers white, 1⅓ in. across, borne singly or in few-flowered cymes on the old wood on ¾ in pedicels. Style short and stout. Fruit greenish-pink, globose 1⅓ in. diam. containing one or two large seeds.

A handsome tree of medium-size found in the evergreen forests of Travancore and Tinnevelly above 4,000 ft., local and rare. Height 60 ft. Diam. 1½ ft.

Flowers in March-April. Fruits June-Aug.

The wood is unknown.

267 4. E. **læta**, Ham; Fl. Br. Ind. ii. 479; Bedd. Fl. Syl. cix, (under *E. Wightii*); Gamble Man. Tim. 358; Brandis Ind. Tr. 318.

Leaves 2½-5 in. by 1-2 in. elliptic-lanceolate, tapering to both ends. glabrous, nerves indistinct. Petiole ¼ in. Flowers crimson or lemon-yellow 1 in. across and 1½ in long, solitary or in pairs, at ends of branches. Calyx-tube nearly cylindrical on 1 in. pedicels. Style long, slender, Fruit ovoid, over 1 in. long, crowned by calyx-lobes.

A medium-sized tree common in the evergreen forests between 1000-4000 ft. Height 50 ft. Diam. 1½ ft. Occurs also on the Western Ghauts and in Tinnevelly.

Flowers Nov.-Jan. Fruits April-May.

Bark smooth, white. Wood brownish-grey, hard and close-grained but coarse. Pores small, in narrow rings. Rays very fine and equidistant, numerous, crossed by bands of pale tissue. Annual rings not seen.

W.=55 lbs. P=739.

The wood is not used.

268 5. E. **hemispherica**, Wight; Fl. Br. Ind. ii. 477; Bedd. Fl. Syl. t. 203; Trimen Fl. Cey. ii 170; Gamble Man. Tim. 356; Brandis Ind. Tr. 318. Tam. *Vellei nyáral* Mal. *Ven nyára.*

Leaves 3-5 in. by 1-2 in. ovate-lanceolate, acuminate, narrowed to base, pale when young, dark green when mature glabrous, nerves inconspicuous. Petiole ⅓ in. Flowers white or rose, ¾ in. across. in terminal and axillary compound cymes. fragrant. calyx-tube hemispherical ⅓ in. long. Fruit purple, globose, nearly 1 in. diam, crowned by calyx-lobes.

A large tree common in evergreen forests through Travancore between 0-2000 ft. Height 90 ft. Diam. 2 ft. Occurs also on the Western Ghauts.

Flowers Feb.-April. Fruits May-June.

Bark smooth, blackish. Wood brown, hard.

The wood is not used, but the buds are sometimes collected and sold in the bazaars in place of cloves. Birds are very fond of the fruit.

269 6. E. **occidentalis**, Bourdillon; Ind. For. xxx. 195; Brandis Ind. Tr. 319. Tam. *Atta sámba.*

Leaves 5-7 in. by $\frac{1}{2}$-$\frac{7}{8}$ in. linear-lanceolate, tapering to both ends, venation indistinct. Petiole stout, $\frac{1}{4}$ in. Flowers white, 2 in. across, 6 or 8 together in terminal and lateral cymes, on pedicels 2 in. and more long. Calyx-tube white, about 1 in. long, funnel-shaped. Petals clawed. Stamens very numerous and thin. Style long and thin. Fruit greenish-pink, ovoid, $\frac{3}{4}$ in. diam.

A small bushy tree found on the banks of the Periyaur in N. Travancore and also in the South, always seen near water rare. Height 25 ft. Diam. 8 in. Endemic.

Flowers Jan.-April Fruits June-July.

A very ornamental tree and deserving of cultivation. Its timber is unknown.

7. E **Jambolana**, Lam; Fl. Br. Ind. ii. 499; Bedd. Fl. Syl. t. 197; Trimen Fl. Cey. ii. 179; Gamble Man. Tim. 361; Brandis Ind. Tr. 323. Eng. *Jambu*. Tam. *Nával: nava*. Mal. *Nága*. 270

Leaves 3-6 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in oblong-oval, tapering to both ends, thick, glabrous not shining nerves very numerous, faint and parallel. Petiole $\frac{1}{2}$-1 in. Flowers greenish-white, fragrant, small, sessile, in compound divaricate cymes about 3 in. long from the axils of fallen leaves. Calyx-tube turbinate, truncate, $\frac{1}{8}$ in. long, petals calyptrate. Fruit $\frac{1}{2}$-$1\frac{1}{2}$ in. long, ovoid, black, pink within crowned with calyx-tube, succulent.

A very large tree common on the Peermerd plateau at 4,000 ft. and elsewhere in the evergreen forests of the hills, and commonly planted as an ornamental tree in gardens and avenues. Height 80 ft. Diam. 2 ft. Occurs through India and Burmah "except in the arid region of Sind and the Southern Punjab" (Brandis) and in Ceylon.

Flowers Dec.-May. Fruits June-August.

Bark $\frac{1}{4}$ in. thick, light grey with large patches of darker colour. Wood reddish-grey, rough, moderately hard, darker near the centre but no distinct heartwood. Annual rings generally marked by a line, with few pores or none. Pores moderate sized and small numerous, often divided, joined together in wavy concentric belts of loose, pale tissue. Rays fine, numerous (Gamble).

W=48 lbs. P=589.

The Jambu is an important and useful tree with a good timber, "reproduces well and gives a good shade. It is easy to grow, but" "the seed must not be kept, as it very quickly loses its power of" "germination. It is perhaps better to sow it at site, or to sow it in" "baskets, for it does not bear transplanting very well, certainly not" "without the earth round the roots. It is one of the best of the" "avenue trees, and if the cultivated varieties with large fruit are used" "it ought to be made a source of some profit. The fruit is astringent," but is not at all bad in tarts and puddings."

"The wood is fairly durable and has been used for railway-" "sleepers. It is not touched by white ants. It is largely used for" "native building purposes, posts, beams and rafters of houses &c.," "for agricultural implements rice-mortars and carts, and for well-"

"work, as it resists the action of water well. It gives a good fuel." "It is one of the trees on which the 'tasar' silkworm. is fed. The" "bark has been used in dyeing and tanning. It is used in medicine" "as a specific for dysentery. Other parts of the plant are also used" "in native medicine" (Gamble).

In Travancore the tree is sometimes planted in gardens and along roadsides, but it does not receive the attention which it deserves. It grows quickly at first, but more slowly afterwards. The leaves are aromatic. Its fruit is said to be a specific for diabetes. (Trop. Agric. xiv, Supplt. pp. 575).

A somewhat similar tree but with thinner leaves and smaller flowers, borne in axillary and terminal cymes, is found in the low country evergreen forests about Kulathurpuzha. It is called *Shen nyáral*. Its fruit is edible. It has not yet been decided if it is a different species or merely a variety of *E Jambolana*. (Brandis Ind. Tr. 323).

271 8. **E. Wightiana**, Wight ; Fl. Br. Ind. ii. 485 ; Bedd. Fl. Syl. cix (under *E. lanceolata* ; Trimen Fl. Cey ii. 172 ; Gamble Man. Tim. 356 ; Brandis Ind. Tr. 319.)

Leaves 3-5 in. by 1-1½ in. lanceolate, acuminate. tapering to base, glabrous, nerves very fine and numerous. Petiole ¼ in. Flowers white, ¾ in. long, fragrant, 8-20 together, sessile in terminal and axillary cymes. Calyx-tube funnel-shaped, tapering below, ½ in. long. Petals up to 12, calyptrate. Style long. Fruit ovoid-turbinate- ½ in. long, bright scarlet.

A moderate-sized tree with dark foliage and a hard but brittle wood, abundant on the Permerd plateau, near Ponmudi and elsewhere on the hills of Travancore from 2000-4000 ft. Heigt 40 ft. Diam. 1 ft. Occurs also on the hills of S. India and in Ceylon.

Flowers Nov. -Jan. Fruits March—April.

Nothing is known of the timber or its uses.

272 9. **E. zeylanica**, Wight ; Fl. Br. Ind. ii. 485 ; Bedd. Fl Syl. t. 202 ; Gamble Man. Tim. 356 ; Trimen Fl. Cey. ii. 171 (under *E. spicata*) ; Brandis Ind. Tr. 321. Mal. *Púlá*.

Leaves ¾-2 in. by ⅓-1 in. ovate or lanceolate-linear, caudate, acuminate, tapering to base, smooth and shining on both sides nerves numerous but inconspicuous. Petiole ¼ in. Flowers white-small, crowded in axillary and terminal cymes on very short pedicels Calyx-tube funnel-shaped, gland-dotted, about ⅙ in. long with very short segments. Petals free. Fruit globose, about ¼ in. diam. white, gland-dotted, crowned with the calyx segments.

A small tree very common in the low country all through Travancore especially on the banks of canals and rivers. Height 30 ft. diam. 9 in. Occurs also on the Western Ghauts, Nepal, the Malay Peninsula, Ceylon, Java and Borneo.

Flowers March—May. Fruits in May—June.

A very handsome little tree with aromatic leaves and edible fruit, well deserving of cultivation. Its timber is not used. Trimen says that it is "brown, heavy and liable to split."

10. **E. rubicunda**, Wight, Fl. Br. Ind. ii. 488 (under *E lissophylla*); Bedd. Fl. Syl. cviii; Trimen Fl. Cey. ii. 173; Gamble Man Tim. 359; Brandis Ind. Tr. 324. 273

Leaves 2–4 in. by $2\frac{1}{4}$—2 in. ovate-lanceolate, caudate-acuminate obtuse, tapering to base, glabrous, nerves fine and very numerous. Petiole $\frac{1}{4}$ in. Branchlets quadrangular. Flowers sessile, small, pinkish-white, in terminal and axillary cymes. Calyx campanulate. segments rounded, petals calyptrate. Fruit globose, the size of a pea.

A medium-sized tree found in evergreen forests from 0—2000ft. Height 50 ft Diam 1 ft. Occurs also on the hills of S. India and in Ceylon.

Flowers April—May. Fruits June—July.

Bark thin, smooth, pale brown. Wood reddish brown, moderately hard, rough. Pores moderate-sized to large, joined by irregular, faint transverse bands. Rays fine and numerous, inconspicuous.

W. = 39 lbs.

A useful wood but not much known.

11. **E. montana**, Wight; Fl. Br. Ind. ii. 488; Bedd. Fl. Syl. cvii; Gamble Man. Tim. 359; Brandis Ind. Tr. 324. Mal. *Poriyil.* 274

Leaves 3-5 in. by 2-3 in. (young leaves often 10 in. by 6 in) ovate, dark-green, glabrous, narrowed to base, nervation marked, nerves 10-15 pairs Petiole $\frac{1}{3}$-$\frac{2}{3}$ in. Branchlets quadrangular, often narrowly winged. Flowers small white, on short stalks, in axillar and terminal cross-armed panicles about 5 in. long, buds crimson calyx-tube turbinate, $\frac{1}{3}$ in. long Fruit globose, purple, succulent, $\frac{1}{3}$ in diam. crowned with calyx-segments.

A large tree common in swampy localities in the low country through Travancore also to be found in the evergreen forests. Height 60 ft. Diam 2 ft. Occurs also at high elevations on the Neilgherries.

Flowers in April—May. Fruit May—June.

Bark dark brown, $\frac{1}{2}$ in. thick. Wood pale brown mixed with patches of bright yellow, coarse, often marred by knots, moderately hard, Pores medium-sized to small, very numerous, arranged in wavy radial bands. Rays very fine, uniform and equidistant Annual rings marked by bands of wood containing smaller pores about 3 to inch.

W = 44 lbs. P. = 489.

The wood is sometimes used for planking and housebuilding.

12. **E. Gardneri**, Thw; Fl. Br. Ind ii 489; Bedd. Fl. Syl cviii; Trimen Fl. Cey. ii. 174; Gamble Man. Tim. 362 (under *E kanarensis*); Brandis Ind. Tr. 321. Tam. *Nir nával* Mal. *Karinyáral.* 275

Leaves 2-$3\frac{1}{2}$ in. by 1-$1\frac{1}{4}$ in. ovate-lanceolate tapering to both ends, pink when young, apple green when mature, glabrous. nerves very numerous and close together, pellucid. Petiole $\frac{1}{4}$ in. Flowers white, 5/1 in. across, sessile in terminal and axillary cymes. Calyx-tube truncate. 1/5 in. long, petals free. Fruit purple, ovoid or nearly globose $\frac{1}{3}$ in. diam.

An enormous tree with a smooth white trunk, common in evergreen forests from 0-5000 ft. Height 100 ft. Diam. 3 ft. Occurs also on the hills of S. India and in Ceylon.

Flowers March—April. Fruits May - June.

Bark smooth, white, $\frac{1}{3}$ in. thick. No regular heart but centre much darker. Wood dark reddish-brown, often with patches of bright yellow through it, very hard and strong but coarse. Pores very small, abundant and evenly distributed. Rays very fine and close together, crossed by irregular wavy lines of soft tissue. Annual rings not seen.

W = 61 lbs. P. = 805.

The timber is sometimes used for beams in house-building. It is a strong, serviceable wood.

276 13. **E. corymbosa**, Lam; Fl. Br. Ind. ii. 490 (under *E caryophyllaea*); Bedd. Fl. Syl. cviii; Trimen Fl. Cey. ii. 174; Gamble Man. Tim. 359; Brandis Ind. Tr. 324. Mal. *Nyára.*

Leaves 2-4 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. obovate oval, acute at base rounded and obtuse at apex, shining, bright green above, pale beneath, nerves numerous, joined by reticulate veins. Petiole $\frac{1}{8}$-$\frac{1}{4}$ in. branchlets terete. Flowers white, small, sessile, crowded in terminal corymbose cymes, buds globose, calyx-limb truncate, $\frac{1}{8}$ in. long, petals calyptrate. Fruit globose $\frac{3}{8}$ in. diam, black, shining and juicy containing 1 or 2 seeds.

A very common small tree found all over the low country, especially near streams, also at 4000-5000 ft., as Chimunji and Mutthukulivayal in evergreen forest. Height 30 ft. Diam. 1 ft. Occurs also on the Western coast, in Ceylon and Borneo.

Flowers February—April. Fruit June—July.

"Bark $\frac{1}{4}$ in greyish-white and brown, very rough. Wood hard, pale brown. Pores medium sized and small, numerous. Rays very fine.

W = 49 lbs.

The fruit which very much resembles a black current is sold in the bazaars to be eaten by the poorer classes.

277 14. **E. Arnottiana,** Wight; Fl. Br. Ind. ii, 483; Bedd. Fl. Syl. cvii; Gamble Man. Tim. 358; Brandis Ind. Tr. 321. Tam. *Nával.* Mal. *Ayri.*

Leaves $1\frac{1}{2}$-3 in. by $\frac{3}{4}$-1 in. elliptic-lanceolate, base rounded, acuminate, coriaceous, nerves numerous and parallel. Petiole $\frac{2}{3}$ in. Flowers $\frac{1}{2}$ in. long, cream-coloured, sessile, in dense clusters forming a compact terminal cyme, buds crimson. Calyx-tube broadly funnel-shaped, $\frac{1}{6}$ in. long. Petals generally free. Fruit oblong-ovoid, dark purple, succulent, eaten but astringent.

A very large tree of the evergreen forests, abundant at 3000-6000 ft. at Peermade and elsewhere on the hills. Height 80 ft. Diam $2\frac{1}{2}$ ft. Occurs also on the hills of S. India but not in Ceylon.

Flowers Dec.—April. Fruits May—June.

Bark blakish-grey. Wood dark greyish-brown, hard and close grained, but rather rough and often full of knots. Pores moderate-sized to small, numerous. often divided, arranged in narrow con-

centric bands. Rays of two kinds, few and broad separated by finer rays and crossed by bands of different colours. Annual rings indistinct.

W = 56 lbs. P = 594.

The wood is sometimes used for rough buildings.

15. **E. chavaran**, nova sp; Brandis Ind. Tr. 324 (under *E.* (*oblata*). *Mal. Chavaran.* 278

Leaves 4-5 in. by 2-3 in. ovate, shortly acuminate, rounded to base, very glabrous, nerves numerous and close together. Petiole $\frac{1}{2}$-$\frac{3}{4}$ in. Branchlets terete. Flowers white, fragrant, sessile, about $\frac{1}{2}$ in. long and broad, in axillary and terminal compound cymes about 2 in. long. Calyx-tube turbinate, truncate $\frac{1}{4}$-$\frac{1}{3}$ in. long and broad, petals calyptrate. Fruit not seen.

Flowers Nov.—Jan. Fruits May—June.

A very large and handsome tree of the evergreen forests on the Periyar river at low elevations, rare. Height 80 ft. Diam. 3 ft. Endemic.

The wood is said to be strong and serviceable, and trees are sometimes hollowed into boats.

16. **E. microphylla**, Bedd, Fl. Br. Ind. ii. 505; Bedd. Fl. Syl cx; Brandis Ind. Tr. 322. 279

Leaves $\frac{1}{3}$-$\frac{1}{2}$ in. by $\frac{1}{6}$-$\frac{1}{4}$ in. elliptic-oblong, obtuse; bright red, quite glabrous when young, prominently black-dotted. Petiole 1/12 in. Branchlets angled and narrowly winged. Flowers in clusters of 5-10 at the ends of branches, calyx-tube 1/5 in. more or less covered with resinous scales, petals small, free, stamens $\frac{1}{4}$ in. long. Fruit the size of a grain of pepper.

A small, much branched and very dense tree found by Beddome on the banks of a river on Muthukulivayal at 4,500 ft. elevation in Travancore, not seen by me.

Flowers in April-May. Fruits July-Aug.

A very ornamental little tree of which nothing is known.

17. **E. Myhendræ**, Bedd. M. S. S., Brandis Ind. Tr. 325. 280

Leaves $\frac{3}{4}$-$1\frac{1}{4}$ in. by $\frac{1}{3}$-$\frac{2}{3}$ in. oblanceolate, obtuse, narrowed to base, glabrous, nerves very numerous, slender and close together. Petiole none or very short. Branchlets quadrangular. Flowers white, very small, sessile in terminal compound cymes about 2 in. long. Calyx-tube turbinate, 1/10 in. long, segments broad, rounded. Fruit not seen.

A handsome tree of medium size found at an elevation of 3000-4000 ft. in the evergreen forests of the Peermade plateau and S. Travancore, also in Tinnevelly. Height 40 ft. Diam. 1 ft.

Flowers April-May, Fruits June-July.

Nothing is known of its uses.

18. **E. cyclophylla**, Thw; Fl. Br. Ind. ii. 494; Trimen Fl. Cey, ii. 177. 281

Leaves $1\frac{1}{2}$-3 in. by $1\frac{1}{4}$-$2\frac{1}{2}$ in. sub-orbicular, sessile, very thick and coriaceous, margins revolute, mid-rib very broad and prominent beneath. Branchlets quadrangular. Flowers small, white, sessile, in terminal cymes generally shorter than the leaves. Calyx-tube turbinate $\frac{1}{8}$ in. long. Fruit globose, purple, about $\frac{1}{4}$ in. diam, crowned with calyx-limb.

A small tree of the higher elevations found at Peermade, and Muthukuli vaval in evergreen forests. Height 30 ft. Diam 8 in. Occurs also in Ceylon.

Flowers in Feb-March. Fruits April-May.

Nothing is known about this tree or its uses.

282 19. **E. bracteata,** Roxb; Fl. Br. Ind. ii 502; Bedd. Fl. Syl. cx; Trimen Fl. Cey. ii. 182; Gamble Man. Tim. 362; Brandis Ind. Tr. 325.

Leaves $1\frac{1}{2}$-3 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. ovate-oblong, acuminate, tapering to base, glabrous and shining, young parts and inflorescence rusty-pubescent. Petiole $\frac{1}{4}$ in. Flowers white, $\frac{1}{3}$ in. across, showy, on slender axillary 1-flowered peduncles, with 2 bracteloes under each flower. Calyx-tube hemispherical, segments large, reflexed after flowering. Petals hairy, twice the length of calyx-segments. Berry globose, orange or red, $\frac{1}{2}$ in. diam, crowned by calyx-segments.

A small tree common in the evergreen forests at Muthukulivayal, and elsewhere above 3,000 ft. Height 40 ft. Diam. 1 ft. Occurs also in the Western ghauts, in Assam and Ceylon.

Flowers March-April. Fruits, May-June.

"Bark yellowish-grey, smooth. Wood hard, close-grained, grey." Pores small and extremely small, joined by concentric" "bands of white tissue which are closely packed. Medullary rays" "very fine numerous" (Gamble).

The tree is not used in any way, but it is ornamental.

283 20. **E. Rottleriana,** W. and A.; Fl. Br. Ind. ii. 502; Bedd. Fl. Syl. cx; Brandis Ind. Tr. 325.

Leaves 1-2 in. by $\frac{1}{2}$-$\frac{3}{4}$ in. ovate-lanceolate, tapering to both ends, copper brown, young shoots and petioles covered with rusty tomentum, glabrous except when young. Petioles $\frac{1}{4}$ in. Flowers very small on $1\frac{1}{2}$ in. peduncles, rusty-brown, solitary on the branches, or a few together on small lateral shoots, with 2 bracteoles under each flower. Calyx-segments triangular, petals longer than the calyx. Fruit not seen.

A very pretty little tree found in our evergreen forests at 4000 ft. (Muthukulivayal) and also in the forests of Tinnevelly. Height 30 ft. Diam. 8 in.

Flowers March-April. Fruits May-June.

Nothing is known of the uses of this tree.

284 21. **E. codyensis,** Munro; Fl. Br. Ind. ii. 501; Bedd. Fl. Syl. cxii; Brandis Ind. Tr. 325.

Leaves $1\frac{1}{2}$-$2\frac{1}{2}$ in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. ovate-oblong or obovate, obtusely acuminate, tapering to base, glabrous and shining above, nerves slender, young parts clothed with rusty pubescence. Petiole $\frac{1}{3}$ in. Flowers greenish-white, $\frac{1}{2}$ in. across on $\frac{1}{4}$ in. peduncles, solitary or few together, axillary or on the old wood, with 2 acute bracteoles below each flower. Calyx-tube green, campanulate, pubescent, lobes broad. Petals oblong, free. Fruit globose, $\frac{1}{4}$ in. diam.

A shrubby little tree found in evergreen forests at 3,000 ft. near Chimunji and elsewhere on the Travancore hills. Height 30 ft. Diam. 10 in. Occurs also on the Neilgherries and in Kurg.

Flowers March-April, Fruits May-June.

The timber is not used.

22. E. **Mooniana**, Wight; Fl. Br. Ind. ii 505; Bedd. Fl. Syl. cx; Trimen Fl. Cey. ii. 187; Gamble Man. Tim. 337; Brandis Ind. Tr. 325. **285**

Leaves 1-3 in. by $\frac{1}{2}$-$1\frac{1}{2}$ in. oval, tapering to base, acuminate, obtuse at apex, glabrous, thin, green on both sides, nerves fine and inconspicuous. Petiole 1/5 in slender. Flowers white, $\frac{1}{2}$ in across on very slender $\frac{1}{2}$ in. pedicels, fasciculate. Calyx tube fusiform, segments lanceolate. Petals often reflexed. Fruit ovoid, $\frac{1}{2}$-$\frac{3}{4}$ in. long, pendulous, crimson.

A small tree found on the Westsrn Ghats from Kanara to the South, and in Ceylon, and fairly common in our evergreen forests at 2000-4000 ft. Height 30 ft. Diam. 10 in.

Flowers March-April. Fruits May-June.

Trimen says that the wood is "yellow, smooth, hard and" "durable, and that the very hard and heavy black sticks universally" "carried by Tamil coolies are obtained from it. The black colour" "is produced by burial in mud for some months."

In addition to the 22 species of *Eugenia* mentioned above there are, undoubtedly, several others indigenous in the Travancore forests which will be found when the Flora has been more systematically examined. Two other species may here be mentioned which are frequently planted in gardens, and may sometimes be found growing, apparently wild, on abandoned estates on the hills and in the low country.

(1) *E. malaccensis*. Eng. *The Malay Apple*. Mal. *Sámba* a beautiful tree 30 ft. high one 1 ft. diam. with large, succulent leaves 8-12 in. by 4-5 in. and large purplish flowers clustering on the wood appearing in, Sept-Oct. Fruit pink and white, 2 in. long, waxy and edible, ripening in Dec. A native of the Malay Archipelago

(2) *E. Jambos*. Eng. *The Rose Apple*. A much branched tree 20 ft. high and 8 in. diam. with lanceolate leaves 6-8 in. by $1\frac{1}{2}$-2 in. and large white flowers 2 in. across appearing from Oct.-Jan. Fruit white, globose 2 in. diam. succulent, edible but insipid, smelling of rose water. Native country unknown.

2. BARRINGTONIA, Forst.

Trees with alternate leaves and minute, caducous stipules. Flowers in long racemes. Calyx tube enclosing the ovary and not produced beyond it, with 2-4 segments. Petals 4 (or 5) imbricate, slightly connate at base and adnate to the staminal tube. Stamens very numerous in several rows, connate at base into a thick tube, all fertile. Ovary inferior 2-4 celled with several pendulous ovules in each. Style long. Fruite indehiscent, 1 celled with 1 seed.

Calyx closed in bud, splitting into 2 or 3 segments. 1 *B. racemosa.*
Calyx not closed in bud, segments 4 . 2 *B. acutangula.*

286 1. **B. racomesa,**, Blume ; Fl. Br. Ind. ii. 507 ; Bedd. Fl. Syl. cxii ; Trimen Fl. Cey. ii. 189 ; Gamble Man. Tim. 363 ; Brand's Ind. Tr. 330. Tam. *Samuthram.* Mal. *Samuthráceham.*

Leaves 6-12 in. by 2-4 in. obovate, tapering to base, acute crenate, shining on both sides. Petiole very short. Flowers 2½ in. diam. cream-coloured with dark pink stamens, on pendulous racemes 1-2 ft. long, terminal or from axils of old wood. Calyx-tube turbinate, splitting irregularly. Fruit oblong ovoid 2-2½ in. long, brownish-red, shining, crowned with calyx segments, seed 1¾ in.

A medium-sized tree of ornamental apperance common on canal- and river-banks in the low country and planted in gardens. Height 30 ft. Diam. 1 ft. Occurse also on the Malabar Coast, the Sundarbans, the Andaman Islands and Ceylon.

Flowers and fruits all the year round.

Wood white, very soft and perishable. Pores small and medium-sized very numerous, almost filling up the space between the rays, which are long, broad, straight and equidistant.

W = 28 lbs. P = 302.

The wood is quite useless, except for work of a very temporary kind and it is of small size. Skinner says that the wood is used for house and cart-building, and that it has been tried for railway-sleepers, but this is incredible.

287 2. **B. acutangula**, Goertn ; Fl. Br. Ind. ii. 508 ; Bedd. Fl. Syl. t. 204 ; Trimen Fl. Cey. ii. 191 ; Gamble Man. Tim. 363, Brandis Ind. Tr. 330. Mal. *Nir pérzha : átta pérzha. Athambu.*

Leaves 3-5 in. by 1-1½ in. obovate or ob-lanceolate, tapering to base, crenate-serrate, bright green, not shining, venation pellucid. Petiole about ¼ in. Flowers red, ⅓ in. across, in terminal, pendulous racemes, 4-12 in. long. Fruit 1-1½ in. long, oblong-ovoid, narrowed to base, bluntly quadrangular.

A medium-sized tree common on river sides and on swampy land through the low country. Height 40 ft. Diam. 1½ ft. Occurs also in the Indian Peninsula, Bengal, Burmah, Ceylon and N. Australia.

Flowers with the young leaves Jan-March. Fruits April May.

Bark brownish-grey, rough, ½ in. thick. Wood greyish-white, soft, shining. Pores small, often divided. Rays very broad to moderately broad, showing a silver-grain on a radial section.

W = 36 lbs. P = 463.

"The wood is more durables than it seems at first sight: it is used for boat-building, well-work, carts, rice-pounders, and by cabinet-makers. If cut so as to show the silver-grain to the best advantage, it would make good furniture, as it apparently does not warp much, if so cut. The bark is used to intoxicate fish, also for tanning, and as well as the leaves and fruit, in native medicine. Beddome says that the wood turns black when buried in mud." (Gamble).

Not used in Travancore.

3. CAREYA, Roxb.

Trees with alternate leaves, not gland-dotted. Flowers large in erect spikes. Calyx-tube not produced beyond the ovary, segments 4. Petals 4, imbricate. Stamens very numerous, epigynous, connate at base into a ring, many without anthers. Ovary 4-celled, inferior, ovules numerous. Fruit globose, rind thick, containing many seeds embedded in pulp.

C. **arborea**, Roxb.; Fl. Br. Ind. ii. 511; Bedd. Fl. Spl. t. 205; 288
Trimen Fl. Cey. ii. 191, Gamble Man. Tim. 364, Brandis Ind. Tr. 332. Tam. *Aymá : pérla.* Mal. *Pérzha.*

Leaves 6-12 in. by 2 4 in. broadly obovate, tapering to base, rounded at apex, crenate, shining on both sides. nerves prominent 10-12 pair. Petiole short or 0. Flowers 2-4 in. across, greenish-white with purple filaments, sessile in thick terminal spikes, each flower with 3 unequal bracts. Calyx tube 1 in. long, campanulate, glabrous. Fruit globose, 2-3 in. diam. apple-like, green, crowned with calyx-segments and style.

A tree of medium size, very common in all deciduous forests from 0-4000 ft. Height 40 ft. Diam. 1 ft. Occurs also throughout India, Burma and Ceylon, avoiding the drier regions.

Flowers appearing with the young leaves. Feb.-April. Fruit ripens June-July.

Bark greyish-brown, rough, $\frac{1}{2}$ in. thick, inner layers red, fibrous. Wood moderately hard, sapwood large, pale, heartwood dark reddish-brown. Pores medium-sized to large, often divided. Rays numerous, fine and uniform, crossed by dark concentric rings at unequal distances. Annual rings not seen.

W = 65 lbs. (Gamble's average 53 lbs.) P = 562 (Gamble 826).

"This is an important tree with a fine wood which is too much neglected. It is common in Sal forests, and is conspicuous by its large leaves. It is a good ornamental tree for avenues and gardens. In suitable places it grows to a large size, but in savannah or patana lands it remains stunted and poor,"

"The wood is durable; but it is little used except for agricultural implements, Kurz says that it is used in Burma for gun-stocks, house-posts, planking, carts, furniture and cabinet-work. It stands well under water. Fuzes made from its bark are used to make slow-matches. Its bark gives a good fibre for coarse, strong cordage, and is used in native medicine as an astringent." (Gamble).

In Travancore the tree is only found on grass-land and does not attain a large size. It is used for rough-posts and for firewood, but I have never heard of its employment for other purposes. The timber of our trees seems heavier but not so strong as that of trees from elsewhere.

ORDER XXXVIII. MELASTOMACEÆ.

Leaves opposite, entire, generally with 3-7 basal nerves, not gland-dotted, stipules none. Flowers regular, bisexual calyx-tube more or less produced beyond ovary, segments 4 or 5. Petals 4 or 5, contorted in bud. Stamens twice the calyx-segments, inserted on the edge of calyx-tube, connective generally prolonged. Ovary wholly or half inferior, 1-or 4-celled with numerous ovules. Fruit a capsule or berry.

An order of little importance, containing chiefly shrubs or herbs, and only 5 trees indigenous in Travancore.

MEMECYLON, Linn.

Trees with entire, glabrous leaves, and small, blue or white flowers in lateral, compound, often umbellate, cymes, or sessile in compact fascicles. Calyx-tube much produced beyond ovary, calyx-segments and petals 4. Stamens 8, anthers opening by slits, connective produced into a horn below. Ovary inferior, 1-celled, Fruit a berry, crowned with the calyx-limb, containing 1 seed.

Leaves petiolate, acute at base.
Flowers pedicelled in pedunculate cymes.
Leaves exceeding 2 in. long. Peduncles many-flowered.
Leaves ovate-lanceolate exceeding 1 in. broad ... 1. *M. edule.*
Leaves linear about $\frac{1}{2}$ in. broad ... 2. *M. angustifolium*
Leaves under 2 in. long. Peduncles 2-3 flowered ... 3. *M. gracile.*
Flowers sessile in compact head ... 4. *M. capitellatum.*
Leaves sessile, base cordate or rounded ... 5. *M. malabaricum.*

289 1. **M. edule,** Roxb. ; Fl. Br. Ind. ii. 563 , Bedd. Fl. Syl. cxiii ; Trimen Fl. Cey. ii. 216 (under *M. rubro cœruleum*) ; Gamble Man. Tim. 368 , Brandis Ind. Tr. 335, Tam. *Kányávu*, Mal. *Káshàva* : *kánalei* : *ánei kombi*.

Leaves $1\frac{1}{2}$-3 in by $1-1\frac{3}{4}$ in. ovate-lanceolate, tapering to both ends, nerves obscure, glabrous and shining. Petiole $\frac{1}{3}$ in. Flowers very small, bright blue, calyx white or pink numerous, in pedunculate cymes on the old wood, generally in the axils of fallen leaves. Fruit. globose, fleshy, edible, black, $\frac{1}{4}$ in. diam.

A tall graceful tree of the evergreen forests ascending the hills to 3000 ft., and not uncommon. Height 60 ft. Diam. 1 ft. Occurs also in S. India, Bengal, Malay Peninsula and Ceylon.

Flowers March-May. Fruits June-July.

Stem cylindrical, bark extremely thin, light brown and marked by fine, vertical cracks. Wood yellowish-brown, very hard, fine and even-grained, but liable to split. Pores small, in groups of soft tissue, often filled with a white substance which gives the wood a mottled appearance. Rays of two kinds, the larger short and fine, the smaller extremely fine. No annual rings.

W = 57 lbs. P. = 851.

A hard, strong wood, but not used because of its occuring thinly scattered through the forests. It is an excellent fuel and makes good charcoal. The leaves yield a delicate yellow-lake dye. The leaves and bark are used medicinally (Dict. Econ. Prod.)

2. *M.* **angustifolium**. Wight.; Fl. Br. Ind. ii. 562: Bedd. 290
Fl. Syl. cxiv: Trimen Fl. Cey. ii. 219: Gamble Man. Tim. 368 Brandis Ind Tr. 336. Mal. *Attu kanalei*-

Leaves 2-3½ in. by about ½ in. linear, tapering to both ends, shining above, paler and dull beneath, nerves indistinct. Petiole ¼ in Flowers very small, bright blue, on slender pedicels 8 or 10 together on ⅙ in. peduncles. Fruit globose, ⅙ in. diam. black-purple.

A pretty little tree or large shrub attaining a height of 20 ft. and a diameter of 6 in. common on the banks of the Periyaur. Occurs also on the banks of streams in Tinnevelly and in Ceylon up to 2000 ft.

Flowers and fruits in November.

Nothing is known of the tree or its wood.

3. **M. gracile**, Bedd.; Fl. Br. Ind. ii. 555; Bedd. Fl. Syl. cxv; 291
Brandis Ind. Tr. 336.

Leaves 1-1¾ in. by ¾ in. ovate-lanceolate, acuminate, tapering to base, bright green on both sides, nerves indistinct. Petiole ⅙ in. Flowers small, calyx white, petals pale blue, 2 or 3 flowers together on slender pedicels, peduncles axillary, solitary, about ½ in. long. Fruit globose, ¼ in. diam.

Beddome calls this a small tree, but I have never seen it more than an elegant shrub about 10 ft. high. It is a common undershrub in our evergreen forests between 1000-3000 ft. Also found in Tinnevelly.

Flowers in March-April. Fruits May-June.

The stem does not grow straight but assumes a zigzag shape. The bark is pale brown, marked by fine vertical cracks. The wood is very hard and tough, and it makes excellent walking sticks when a fairly straight stem is found.

4. **M. capitellatum**, Linn.; Fl. Br. Ind. ii. 564 (under *M. edule*); 292
Bedd. Fl Syl. t. 206; Trimen Fl. Cey. ii. 222; Gamble Man. Tim. 369; Brandis Ind. Tr. 336.

Leaves 1½-5 in. by ¾-2 in. oblong, narrowed into the petiole, obtuse or rounded-acuminate, thick, shining, bright green, paler beneath, nerves distant, distinct when dry, 3-nerved at base. Petiole about ⅙ in. Flowers very small, violet-blue, sessile, in small heads at the ends of stiff peduncles about 1 in. long, from the axils of present or fallen leaves. Fruit globose, up to ½ in. diam. black-purple.

A small tree not uncommon in our evergreen forests at 3000-4000 ft. Height 20 ft. Diam. 6 in Occurs also in Tinnevelly and Ceylon.

Flowers March-April. Fruits May-June.

"Wood hard, strong. The leaves turn orange-yellow when dried, they afford a yellow dye." (Trimen).

293 5. **M. malabaricum**, Cogniaux: Fl. Br. Ind. ii. 559 (under *M. amplexicaule*): Bedd. Fl. Syl. t. 206 (under *M. umbellatum*); Gamble Man. Tim. 369, Brandis Ind. Tr. 337. Tam. *Kányávu* Mal. *Káshàva*.

Leaves 2-6 in. by 1-1⅜ in. base cordate, often clasping the stem, sessile, ovate-lanceolate, acuminate, glabrous, nerves obscure. Flowers pale-blue, small, on slender pedicels in 10 or many-flowered umbels on short peduncles. Fruit globose, $\frac{1}{3}$ in. diam

A small tree up to 20 ft high and 6 in. diam. not uncommon in our evergreen forests from sea-level up to 7000 ft but thinly scattered. Occurs also all down the Western Ghauts from N. Kanara, and on the Palnies.

Flowers Jan.—May. Fruits April-Aug.

Bark brown, very thin, marked with fine vertical cracks. Wood greyish-brown, very hard, close-grained. Pores small, arranged in groups. Rays fine and very fine.

W. = 65 lbs. (Gamble).

The wood is used for fuel, but it is too small for any other purpose. Beddome suggests that it might be used as a substitute for box-wood.

Order XXXIX. LYTHRACEÆ.

Trees with opposite, entire, simple leaves, stipules 0 or minute. Flowers regular, bisexual. Calyx cup-shaped, persistent, segments 4-6. Petals 4-6, imbricate, stamens double the number of petals or indefinite, inserted on the calyx-tube. Ovary superior 3-many-celled with many ovules in each. Fruit capsular or indehiscent. Seeds numerous.

A small order containing only 4 trees indigenous in Travancore. It includes *Lawsonia alba* the Henna plant, and *Punica Granatum* the Pomegranate, both of them introductions from Persia.

Inland trees, Fruit a dry capsule.
Stamens indefinite. Capsule 3-6-valved . 1. *Lagerstrœmia.*
Stamens 12. Capsule circumscis . 2. *Pemphis.*
Littoral trees. Fruit fleshy, indehiscent . 3. *Sonneratia.*

1. LAGERSTRÆMIA. Linn.

Large trees with flowers in axillary or terminal panicles. Calyx-tube hemispherical, petals clawed. Stamens very numerous. Ovary free, 3-6 celled. Fruit a dry capsule. Seeds winged.

Calyx-tube smooth, not ribbed. Capsule under ½ in. 1. *L. lanceolata*
Calyx-tube pubescent, strongly ribbed. Capsule exceeding ½ in. . 2. *L. Flos Reginæ.*

1. **L. lanceolata**, Wall ; Fl. Br. Ind. ii. 576 ; Bedd. Fl. Syl. t. 32. Gamble Man. Tim. 372 ; Brandis Ind. Tr. 338. Tam. *Vevala* Mal. *Venthekku* ; *velillávu*. 294

Leaves 2-4 in by $1\frac{1}{2}$-2 in. ovate-lanceolate, tapering to both ends, glabrous and shining above, bluish-white below. Petiole $\frac{1}{4}$-$\frac{1}{2}$ in. Flowers $\frac{1}{4}$ in. across, white, fragrant, in terminal, sometimes axillary panicles. Calyx smooth, hoary, segments reflexed. Capsule ovoid, $\frac{1}{3}$-$\frac{1}{2}$ in. long.

A very large tree with a smooth, white bark, peeling off in thin flakes, very common in the deciduous and drier evergreen forests from 0-3000 ft. Height 100 ft. Diam. 3 ft. Occurs also all down the Western Coast from Bombay southwards and in Mysore and the Neilgherries.

Flowers April-June. Fruits Aug.-Nov.

Bark white, smooth. Wood reddish-brown, moderately hard, Pores large and medium sized, often divided, the larger running in concentric rings and indicating the spring wood, crossed by wavy irregular bands of soft tissue. Rays very fine, very numerous, indistinct, bent round the pores.

W.=43 lbs. P.=596.

A very important tree yielding one of our best second class woods, The timber is much in demand for foreign boat-building. It is worked down from the forests chiefly in the form of large planks for export. It is also used for furniture and for house-building, and it makes good shingles, as it splits well. White ants do not eat the heart, The quantity sold each year is about 10,000 c. ft. and its value is 10-12 annas per c. ft. in log.

Under favourable circumstances the growth is fast; measured trees showed a diameter of 10 in. in 11 years. This would give between 2 and 3 rings per inch, but the rings of other specimens counted by me gave 10-15 rings per inch. These were probably from older wood, and from trees grown on poor soil.

2. **L Flos Reginæ**, Retz. ; Fl. Br. Ind. ii. 577 ; Bedd. Fl. Syl ; t. 29 ; Trimen Fl. Cey. ii. 228 ; Gamble Man. Tim. 371 ; Brandis Ind. Tr. 339. Tam. *Púmaruthu*. Mal. *Mani maruthu*: *nir maruthu*, 295

Leaves 6-10 in. by 2-4 in. ovate-lonceolate, rounded at base, acute glabrous on both sides. Petiole stout, $\frac{1}{4}$-$\frac{1}{2}$ in. Flowers 2-4 in. across, mauve or pink in large, pyramidal panicles $1\frac{1}{2}$-2 ft. long calyx-tube mealy-pubescent, 12-ribbed. Petals 1-$1\frac{3}{4}$ in. long, margin undulate. Fruit $\frac{3}{4}$-$1\frac{1}{4}$ in. brown, broadly ovoid, apiculate, woody, smooth, seed with wings $\frac{1}{2}$ in pale brown.

A large tree generally found along river banks or in areas likely to be flooded, never far from water, common at the lower elevations through Travancore up to 3000 ft. and often cultivated. Height 80 ft. Diam. 3 ft. Occurs on the Western Coast, in Bengal, Assam, Burmah and Ceylon.

Flowers March-April. Fruits Oct-Jan.

Bark pale brown, smooth, $\frac{1}{3}$ in. thick, peeling off in irregular flakes. Trunk often buttressed. Wood shining, brownish-red, fairly smooth, close-grained, hard, resembling that of *L. lanceolata* but harder, redder and not so easy to split. Pores varying much in size from very small to large, often divided, joined by wavy bands of soft tissue. Rays very fine, indistinct. Annual rings marked by lines of larger pores.

W. = 41 lbs, P. – 500.

But according to the experiments quoted by Gamble, the value of P. should be somewhat higher. (average 685).

The timber of this tree is quite as good as, if not better than the last named, but it is far less common, and the tree is much inclined to branch, so that good logs cannot be easily obtained. Gamble says that it is the " chief timber tree of Assam, Eastern Bengal and " Chittagong, and one of the most important of the trees of Burma," but he notes that " at its best, it grows only crooked and knotty and " therefore there is considerable waste in the utilisation of the " wood." He adds " The timber is used for ship-building, for " " boats and canoes, for construction and carts. It has been used " " for gun-carriages, and was recently recommended for gun stocks," " but the report was unfavourable."

It is a very handsome tree when covered with its large lilac flowers, and has been for a long time planted in gardens and along avenues on this account. It loses its leaves completely about the end of February and puts on a new covering with remarkable rapidity. The natural reproduction is poor, it is difficult to raise plants from seed in nurseries, but with the small demand for the timber the existing stock is probably being maintained. With so many other fine woods to grow it does not seem worth while to devote attention to one which requires peculiar conditions for success. Gamble says that the growth is moderate, the specimens examined by him showing on an average 7 rings per inch of radius. My specimens gave 11 per inch.

2. PEMPHIS, Forst.

Trees with fleshy leaves and axillary solitary flowers. Calyx-tube campanulate, 12-ribbed, pubescent, with intermediate teeth between the 6 segments. Petals 6, undulate, spreading, Stamens 12. Ovary free, 3 celled at base. Fruit a capsule enclosed for the greater part in the calyx-tube, the upper part coming off like a cap.

29(**P. acidula**, Forst; Fl Br. Ind ii. 573; Bedd. Fl. Syl. cxvii Trimen Fl Cey. ii 227. Brandis Ind. Tr. 339.

Leaves $\frac{1}{2}$-$1\frac{1}{2}$ in by $\frac{1}{4}$-$\frac{3}{4}$ in. lanceolate-oblong, tapering to base, obtuse at apex, covered as well as the branches with grey, silky pubesence. Petiole 0. Flowers $\frac{3}{4}$ in. across, pink, or pubescent, pedicels $\frac{1}{2}$ in. long, capsule globose, $\frac{1}{4}$ in diam. Seeds numerous, angular.

A shrub or small tree attaining a height of 35 ft, (Fl Br Ind.) found by Beddome on the sea coast and tidal backwaters of Travancore, not observed by me. Occurs also on the sea shores of Ceylon, and through tropical Asia, the Pacific Islands and Australia.

Flowers July-Aug.

Nothing is known of the tree or its uses.

3. SONNERATIA Linn. f.

Trees with thick leaves and large terminal flowers, 1-3 together. Calyx-tube campanulate, slightly adnate to ovary, segments 4-6. Petals 4-6. Stamens very numerous, very long. Ovary nearly free, many-celled. Fruit fleshy, indehiscent, supported by the persistent calyx.

S. acida, Linn. f, Fl. Br. Ind. ii. 579, Bedd. Fl. Syl. cxviii, Trimen Fl Cey. ii. 229. Gamble Man. Tim. 377, Brandis Ind. Tr 340. Mal. *Thirala* 297

Branches 4-angled, leaves 2-4 in. by 1½-3 in. obovate nearly orbicular, tapering to base, obtuse, glabrous, nerves obscure. Petiole ⅛-⅓ in. Flowers dark pink or rose-purple, 2 in. across and long, calyxtube shallow, not ribbed, segments triangular. Petals linear, acuminate, 1½ in. long. Fruit green, smooth, depressed-globose 1-2 in. diam, seated on the reflexed calyx and terminating in a long beak in 2-3. long.

A small evergreen tree, common on the back waters and on river side through the low country of Travancore, and attaining a height of 30 ft. and a diam. of 1 ft. Occurs also through India, Burma and Ceylon, also in Africa and Australia.

Flowers and fruits Feb.-April.

"Wood grey, soft even-grained. Pores small, oval and sub-" "divided, very numerous, uniformly distributed. Medullary rays" "very fine very numerous, bent round the pores." (Gamble)

W.—36 lbs. (Gamble).

Beddome says that the wood is "used for models." A peculiarity of the tree is its erect root-branches of which Trimen says "as" "they attain 18 in. to 3 ft. in height, and 3 in. in diameter, and" "have a soft, firm, even texture, they form a fine substitute for" "cork, and are cut into slices and used for entomologists' boxes" "and other purposes, Their wood is very much lighter that that" "of the stem." I have never heard that any use was made of the wood in Travancore. The fruit is saidto be edible,

ORDER XL. SAMYDACEÆ,

Trees with simple, alternate leaves, stipules very small. Flowers small, regular, bisexual. Calyx-tube short, segments 4-5. Petals none or 4-5, imbricate, and alternate with calyx-segments. Stamens 4-10, perigynous, alternating with staminodes. Ovary superior or half-inferior, 1-celled, ovules many. Fruit a soft capsule splitting into 2 or 3 valves, seeds surrounded by a fleshy aril.

A small Order containing 4 trees indigenous in Travancore.

Flowers in axillary fascicles. Petals 0. Ovary superior. 1. *Casearia.*
Flowers in racemes. Petals 4 or 5. Ovary half-inferior. 2. *Homalium.*

1. CASEARIA, Jacq.

Trees with entire or crenate leaves, and flowers in axillary fascicles. Calyx free, deeply lobed. Petals 0. Stamens 8-10, united into a short tube with alternating staminodes. Capsule 3-valved. seeds many,

Leaves glabrous, quite entire. 1. *C. esculenta.*
Leaves pubescent beneath, base entire, upper part serrated. 2. *C wynadensis.*

298 1. **C. esculenta,** Roxb ; Fl. Br. Ind. ii. 592 ; Bedd. Fl. Syl. t. 208 (under *C. varians*) ; Trimen Fl. Cey. ii. 237 ; Gamble Man. Tim. 379 ; Brandis Ind. Tr. 343. Mal. *Vella kunnan: malam pávatta* : *panni muranga.*

Leaves 2-5 in. by 1-2¼ in. entire, ovate-lanceolate, tapering to base, shortly acuminate, very glabrous, thick, midrib red. Petiole ⅓ in Flowers greenish, ⅓ in. across, on ¼ in. pedicels in axillary clusters. Fruit broadly ovoid, apiculate, ½-1½ in. long, bright orange, splitting into 3 valves and disclosing the scarlet aril surrounding the seeds.

A tree of medium size common in our evergreen forests from 0-1000 ft. Height 70 ft. Diam. 1½ ft. Occurs all up the Western Coast, in Ceylon and the Malay Peninsula.

Flowers Nov.-March. Fruits Dec.-May.

Bark green, mottled, rather smooth ⅙ in. thick. Wood yellowish-white, moderately hard, even-grained but inclined to split. Pores small, scanty, evenly distributed. Rays fine, numerous, equidistant, giving a satiny silver-grain.

W. = 56 lbs. P. = 965.

The tree does not seem to be used in any way, though the wood is not bored by insects. The fruit is said to be used as a dye.

299 2. **C. wynadensis,** Bedd ; Fl. Br. Ind. ii. 593 ; Bedd. Fl. Syl. cxx ; Gamble Man. Tim. 378 ; Brandis Ind. Tr. 344. Mal. *Kari kunnan.*

Leaves 4-6 in. by 1½-2 in lanceolate with a long acumination, entire at base, upper part sharply serrated, beneath softly pubescent, Petiole ½ in. Flowers small, greenish 6-8 together in axillary fascicles on short, pubescent pedicels ¼ in. long. Calyx-segments, ovary and style hairy. Fruit orange, 3-valved with a red aril, smaller than the last but similar.

A small tree up to 30 ft. high and 8 in. diam. found in the evergreen forests of Travancore, Tinnevelly and Malabar between 2000-3000 ft.

Its timber has not been examined.

2. HOMALIUM, Jacq.

Trees with crenate leaves and small, hairy flowers in long, axillary racemes. Calyx-tube adnate to ovary, 4-5 lobed. Petals 4-5,

linear. Stamens solitary or in fascicles, opposite petals, alternating with as many pubescent staminodes. Ovary half-inferior. Fruit a capsule, seed small.

Stamens 4-5, one opposite each petal.	1. *H. zeylanicum*.
Stamens 15-20, in fascicles of 3-4 opposite each petal.	2. *H travancoricum*.

1. **H. zeylanicum**, Benth ; Fl. Br. Ind. ii. 596 ; Bedd. Fl. Syl. t. 210 ; Trimen Fl. Cey. ii. 239 ; Gamble Man. Tim. 331 ; Brandis Ind. Tr. 345. Mal. *Manthala mukki*. 300

Leaves 4-5 in. by 2-3in. oval, narrowed to base, shortly acuminate, crenate-serrate, glabrous on both sides, nerves 6-8 pair, prominent. Petiole $\frac{1}{3}$ in. Flowers very small, fragrant, greenish-white in axillary, pendulous racemes 6-8 in. long, sometimes on the old wood, stamens solitary. Fruit not seen.

Flowers in March-April.

A lofty, straight growing, evergreen tree found in the forests of Travancore at low elevations, especially common on abandoned coffee estates at 2000-3000 ft. Height 100 ft. Diam. 2 ft. Occurs also in the Western Ghauts from Kanara southwards and in Ceylon,

Bark pale, rough, $\frac{2}{3}$ in. thick, Outer wood reddish-yellow, inner dark brownish-red, close and even-grained, but inclined to split. Pores moderate-sized, abundant, in radial lines. Rays fine, numerous and close-packed, white and easily seen. Annual rings indistinct.

W.=56 lbs. P=777.

Beddome says that the wood is very strong and in use for building and other pursoses. I.have never heard of its being used, but the hillmen say that it is a good wood, and it is not bored by insects. It is a very ornamental tree, the young leaves being bright red, and it grows fast and straight, showing no tendency to branch. It would be worth cultivation,

2. **H. travancoricum**, Bedd ; Fl. Br. Ind. ii. 598 ; Bedd. Fl. Syl. t. 201 ; Gamble Man. Tim. 380 ; Brandis Ind. Tr. 345. 301

Leaves 2-4 in. by 1-2 in. ovate, base rounded, obtuse or with a blunt point, crenate, glabrous on both sides, nerves 4-6 pair, prominent. Petiole $\frac{1}{3}$-$\frac{2}{3}$ in. Flowers very small, greenish-white, subsessile, clustered in groups, in pendulous, axillary, spicate racemes 2-4 in. long, stamens 15-20 in groups of 3-4. add 'eudemic and rare'.

A tree of medium size, seen once by me on Peermade at an elevation of 3500 ft. and found by Beddome in. S. Travancore and Tinnevelly. Height 40 ft. Diam. $1\frac{1}{2}$ ft. endemic and rare.

"Bank 1/6 in pale yellow, red inside, smooth. Wood redish brown, rough and hard. Pores very small and abundant. Rays very fine and close together".

W=51 lbs. P=610.

ORDER XLI, DATISCACEÆ.

Trees with alternate, simple, exstipulate leaves, and small dioecious, apetalous flowers. Male flowers in panicles at the ends of the branches, calyx deeply cut into 4 segments, stamens 4. Female flowers in pendulous, terminal racemes, calyx-tube connate with

ovary, segments 4. Ovary inferior, 1-celled, with numerous ovules. Capsule small, 8-ribbed, ovoid, opening at the summit, seeds minute.

This Order contains only one tree indigenous in Travancore.

TETRAMELES. Brown.

Characters of the Order.

302 **T. nudiflora**, Brown ; Fl. Br. Ind. ii. 657 ; Bedd. Fl. Syl. t. 212 ; Trimen Fl. Cey. ii, 265 ; Gamble Man. Tim. 381 ; Brandis Ind. Tr. 346. Tam. *Chini* : *piyei*. Mal. *Chini* : *vella pasa*.

Leaves 3-7 in. each way, broadly ovate, base cordate, 5 basal nerves acute, irregularly dentate, bright green and glabrous above, paler beneath with yellow venation, pubescent. Petiole 2-6 in. Flowers yellowish-green ⅛ in. across, very numerous, capsule ⅛ in. long, urceolate, rough.

An immense tree with a pale, smooth, cylindrical, unbranched stem supported by large buttresses. Found through all our forests, ever-green or deciduous from 0-2500 ft. Height 150 ft. Diam. 5 ft. Occurs also in Northern India, Burmah, the Western Peninsula and in Ceylon. Drops its leaves in January and remains bare for some time.

Flowers in Feb.-March when the tree is leafless. Fruits April-May.

Bark greyish-white, smooth, ⅜ in. thick. Wood very coarse, greyish-white, rough and soft. Annual rings marked by a line of close pores. Wood-cells large. Pores large, often divided and in short zig-zag, transverse lines. Rays fine and moderately broad, conspicuous as white lines on a grey ground.

W=24 lbs. P=321.

Although so light a timber "chini" is not so perishable as many others. Though eaten by white ants it is not touched by the borers which commonly riddle "Cotton wood" "Venkotta" and the different species of Myristica, Semecarpus and similar light woods. It has been tried for tea-boxes, but for this purpose the timber is too rough, and is not so suitable as the Bombax. Its chief use in Travancore is for dug-out canoes, all the small boats on the rivers and back-waters being of this wood and mango. If rubbed with fish oil such boats will last 8 or 10 years. They are especially useful when travelling in rocky rivers, where the boats have to be dragged over reefs, the lightness of the wood facilitating their removal.

This tree propagates itself readily from seed, the seeds being very small and easily carried by the wind. The rate of growth is very fast, but I have not taken any measurements nor have they been recorded by others.

ORDER XLII. ARALIACEÆ.

Trees with alternate, compound leaves, stipules adnate to the petiole. Flowers regular, bisexual. Calyx-tube adnate to ovary, segments very small or 0. Petals 6 or 5, valvate or imbricate, caducous. Stamens as many as petals, epigynous. Ovary inferior.

crowned with the epigynous disk, 2-6 celled with pendulous ovule in each. Fruit a small berry, indehiscent, with several pyrenes, albumen sometimes ruminate.

An order of no importance containing 5 small trees and several epiphytic shrubs which often resemble trees.

Stem prickly. Petals slightly imbricate. 1. *Aralia*.
Stem unarmed. Petals valvate.
Leaves digitate. 2. *Heptapleurum*.
Leaves pinnate. 3. *Polyscias*.

1. ARALIA.

Trees with pinnate or bipinnate leaves and serrulate, membranous leaflets. Stem prickly. Flowers umbellate, calyx-tube 5-toothed, petals 5, ovate. slightly imbricate in bud. Stamens 5, ovary, 2-5 celled. Drupe more or less ribbed, containing 2-5 pyrenes.

A. malabarica, Bedd; Fl. Br. Ind. ii. 722; Bedd. Fl. Syl. cxxi; Gamble Man. Tim 383; Brandis Ind. Tr. 351. 303

Leaf-rachis 2-3 ft. long, bipinnate with a pair of leaflets on the common petiole at the base of each pair of pinnæ, $2\frac{1}{2}$-$4\frac{1}{2}$ pair leaflets on each pinna, leaflets caudate-acuminate, sharply serrate, subsessile 3-6 in. by 1-2 in. Flowers umbellate, about 20 together in $\frac{1}{2}$ in. pedicels, in large panicles. Fruit 10 ribbed.

A small tree found in the evergreen forests of Travancore at 2000 ft. elevation. It also occurs all down the Western Ghauts. Height 20 ft. Diam 6. in.

Bark dark greenish-brown, prickly.

The wood is unknown.

2. HEPTAPLEURUM.

Unarmed trees, often epiphytic, with digitate leaves. Flowers in racemes or umbels often polygamous, petals valvate, 5—8 often cohering in a cap. Stamens 5-6, ovary 5-8 celled. Fruit globose, often fleshy, containing 5-6 one-seeded pyrenes. Albumen often ruminate.

Fruit crowned by long styles, seeds convex, albumen ruminate.
Leaflets entire. Flowers in racemes. 1. *H racemosum*.
Leaflets ofted serrate. Flowers umbellate in panicles. 2. *H. rostratum*.
Fruit crowned by a conical disk, seeds flat, albumen equable.
Leaflets entire. Flowers in long-stalked umbels. 3. *H. Wallichianum*.

1. **H. racemosum,** Bedd.; Fl. Br. Ind. ii. 729; Bedd. Fl. Syl. t. 214; Trimen Fl. Cey. ii, 282; Gamble Man. Tim. 385; Brandis Ind. Tr. 348. 304

Leaflets 3-8, each 4-7 in. by $1\frac{1}{2}$-3 in. acuminate, glabrous, entire, margin undulate. Petiolules 1-2 in. common petiole 6-9 in. Flowers pale green $\frac{1}{4}$ in. across, in stalked racemes forming a large panicle. Fruit ovoid, $\frac{1}{4}$ in. long, ribbed.

A tree of medium size, occurring in all our evergreen forests above 3000 ft. Height 30 ft. Diam. 8 in. Found elsewhere on the hills of Southern India and in Ceylon.

Flowers in Jan.-April. Fruits March June.

Beddome speaks of this species as a large tree, but it is not so with us. Gamble says that it has a soft grey wood.

305 2. **H. rostratum,** Bedd; Fl. Br. Ind. ii. 729; Bedd. Fl. Syl. cxxii; Gamble Man. Tim. 385; Brandis Ind. Tr. 348.

Leaflets 5-9, ovate-lanceolate, glabrous, distantly serrated or entire, acute, each 3-7 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in. Petiolules about 1 in. common petiole 6-8 in. Flowers pale green, $\frac{1}{4}$ in. across, 10-20 together in umbels arranged in large panicles. Fruit ovoid, ribbed.

A tree of medium size, similar to the last and found in evergreen forests from 3000 ft. upwards. Height 30 ft. Diam 10 in. Occurs also in the Neilgherries and Anamalais at high elevation.

Flowers in March-April. Fruits May-June.

The timber is unknown.

306 3. **H. Wallichianum,** C. B. Clarke; Fl. Br. Ind. ii. 730; Bedd. Fl. Syl. cxxii; Trimen Fl. Cey. ii. 284 (under-*exaltatum.*) Gamble-Man. Tim. 385; Brandis Ind. Tr. 348.

Leaflets 4-8, each 5-10 in. by $2\frac{1}{2}$-4 in. glabrous, oblong, acute, coriaceous, entire. Petiolules $1\frac{1}{2}$-2 in. common petiole 8-9 in. Flowers pale green, $\frac{1}{3}$ in. across, 12-20 together in long-stalked umbels arranged in a large panicle. Fruit $\frac{1}{4}$ in. diam globose, ribbed, crowned by the enlarged disk.

A tree of medium size found in our evergreen forests above 2000 ft. Height 40 ft. Diam 1 ft. Also on the mountains of Southern India and in Ceylon.

Flowers in Feb.-April. Fruits May-Ju.

Bark $\frac{1}{3}$ in. thick, grey, rather rough. Wood yellowish grey, soft and coarse. Pores small, evenly distributed. Rays very long, moderately broad to fine, very abundant. Annual rings marked by grey lines 2-3 to inch.

W = 27 lbs P = 244.

3. POLYSCIAS. Forst.

Unarmed trees with odd-pinnate leaves and entire leaflets. Flowers in umbellate panicles, calyx-tube 5-toothed. Petals 5, valvate. Stamens 5. Ovary quite inferior, 4-5 celled. Styles distinct. Fruit ovoid, ribbed, pyrenes compressed, albumen equable.

307 **P. acuminata,** Seem; Fl. Br. Ind. ii. 727; Bedd. Fl Syl t. 213; Trimen Fl. Cey. ii. 218; Gamble Man. Tim. 385; Brandis Ind. Tr. 349.

Leaf-rachis 8-9 in. leaflets 5-7 lanceolate, acute at both ends, glabrous, entire, 3-5 in. by 1-2 in. Petiolule $\frac{1}{4}$ in. Flowers pale green, $\frac{1}{4}$ in. across, in little umbels arranged in panicles or compound umbels. Fruit crowned with calyx-limb and spreading styles, glabrous.

A small tree found by Beddome on the Tinnevelly and Travancore hills in evergreen forests above 4000 ft. not seen by me. Occurs also in the Neilgherries and Anamalais and in Ceylon.

Flowers Feb.-May. Fruits May June.

The timber has not been examined.

Order XLIII. CORNACEÆ.

Trees with alternate, entire leaves, stipules none. Flowers regular, bisexual, in axillary or terminal cymes or panicles. Calyx-tube adnate to ovary, segments 4-5. Petals 4-10, valvate, Stamens 4-5 or many, epigynous. Ovary inferior, 1-celled with one pendulous ovule. Fruit a succulent drupe, seed oblong with copious albumen.

An Order of little importance containing 3 trees indigenous in our forests.

Petals very long, reflexed. Stamens 15 or more.	1. *Alangium.*
Petals short, erect. Stamens 4-5.	2. *Mastixia.*

1. ALANGIUM, Lam.

Small trees, leaves 3-nerved at base. Flowers in axillary clusters. Petals very long, linear, reflexed. Stamens 15 or more filaments short, anthers long. Style very long, stigma 4-lobed. Seed, smooth.

A. Lamarckii, Thw.; Fl. Br. Ind. 741; Bedd, Fl. Syl. t. 215. Trimen Fl. Cey. ii. 285; Gamble Man. Tim. 389. Brandis Ind. Tr. 308
354. Tam. *Alanji*: *acchan cheddi*, Mal. *Arinjil*: *valli thondi*.

Leaves 2-6 in. by $\frac{1}{2}$-2 in. oblong-lanceolate, acuminate, obtuse at apex, pale green when young, at length very dark green, glabrous above, pubescent on veins beneath, venation very marked, 4 or 5 pairs. Petiole $\frac{1}{4}$ in. Flowers fragrant, white, about 1 in. long few together in axillary fascicles. Fruit globose, 1 in. diam. purplish-red, finely pubescent, crowned with the calyx-limb, containing one seed surrounded by succulent pulp.

A very common shrub often with short, spinous branches, found on all waste places in the drier parts, as Panagudi and Puliyara, sometimes growing into a tree 30 ft. high and 1 ft. diam. In the moister forests it is a climbing shrub, not arboreous. Found through India, Malaya and Ceylon.

Flowers in March-April. Fruits May-June.

Bark smooth, yellowish-brown, $\frac{1}{4}$ in. thick. Wood hardly and close-grained, sapwood yellow, heartwood of small size, chesnut-brown with a pleasant odour. Pores small, few, in short, radial lines. Rays fine and closely packed, wavy.

W. = 55 lbs.

The wood is very handsome, the bright-brown of the heart contrasting with the yellow sapwood and it would do well for cabinet work. It is not used in Travancore. Gamble says "It seasons well and cuts easily. It is used for pestles, oil-mills, wooden cattle-bells and other purposes, and is an excellent fuel. The seed and the bark of the root are used medicinally and the fruit is eaten. An oil is extracted from the seeds.

"The growth is moderately slow, perhaps 5 rings per inch of radius." (Gamble).

2. MASTIXIA. Blume.

Large trees with pennlveined leaves. Flowers small in terminal panicles. Petals short, triangular, erect. Stamens 5, anthers short. Style simple. Seed grooved down one face.

Trees of the hills Leaves glabrous. Bracts less than $\frac{1}{4}$ in. 1. *M. arborea*.

Trees of the plains. Leaves pubescent. Bracts exceeding $\frac{1}{2}$ in. 2. *M. pentandra*.

309 1. **M. arborea,** C. B. Clarke; Fl. Br. Ind. ii. 745; Bedd. Fl. Syl t. 216; Trimen Fl. Cey. ii. 287; Gamble Man. Tim. 391; Brandis Ind. Tr. 356.

Leaves 3-8 in. by $1\frac{1}{2}$-3 in. obovate-oval, tapering to base, suddenly acuminate, glabrous and shining, pale green when young, dark green when mature, veins distant. Petiole $\frac{1}{2}$-$1\frac{1}{4}$ in. Flowers yellowish-green, $\frac{1}{4}$ in. across, fleshy 3 or 4 together, in terminal, corymbose panicles, bracts lanceolate, acute. Fruit cylindrical-ovoid, smooth, greenish-purple, $1\frac{1}{4}$ in. long.

A large tree common in our evergreen forests at 3000 ft. and upwards. Height 100 ft. Diam. 2 ft. Also found in Cachar, the Neilgherries and Ceylon.

Flowers in Feb.-March. Fruits May-June.

Bark pale brown, mottled with dark brown, covered with lenticels, $\frac{1}{2}$ in. thick. Wood greyish-yellow, coarse and soft but straight-grained. Pores small, very abundant and evenly distributed. Rays of two kinds, broad, distant and conspicuous, and very fine, close together and indistinct. Annual rings none.

W.=32 lbs. P.=452.

The gum from the tree has a camphoraceous smell. The wood is useless.

310 2. **M. pentandra,** Blume; Fl. Br. Ind. ii. 746; Gamble Man. Tim. 391; Brandis Ind. Tr. 356. Mal. *Vell' adambu: nir kuranthu.*

Leaves 4-7 in. by 2-$2\frac{1}{2}$ in. oblong, tapering to both ends, pubescent above and below, pale green. Petiole $\frac{3}{4}$-$1\frac{1}{2}$ in. Flowers small, green, in terminal panicles, bracts $\frac{1}{2}$-$1\frac{1}{4}$ in. long. Fruit as in the last.

A very large tree, fairly common in evergreen forests and on river sides from sea level to 1000 ft. Height 100 ft. Diam. $2\frac{1}{2}$ ft. Also occurs in the forests of Malabar.

Flowers in Feb.-March. Fruits May-June.

Bark $\frac{1}{3}$ in thick. Wood greyish-white, coarse, soft and shining. Pores small and very numerous, evenly distributed. Rays uniform, fine, numerous and prominent on a vertical section. Annual rings none.

W.=28 lbs P.=331.

The wood is bad and soon decays.

NOTE:—Sir D. Brandis considers these two trees to be identical.

COROLLIFLORÆ.

ORDER XLIV. CAPRIFOLIACEÆ.

Small trees with opposite, exstipulate leaves. Flowers regular, bisexual in paniculate cymes. Calyx-tube adnate to the ovary, segments 5. Corolla tubular, lobes 5, imbricate, equal. Stamens 5 on the corolla-tube, alternate, with its lobes. Ovary inferior, 1-3 celled with one ovule in each cell. Fruit a drupe with a thin endocarp, 1-seeded.

A small Order containing only one Travancore tree. Some plants of the Order in other countries are astringent; others have emetic and purgative qualities; many have showy flowers, but none are important.

VIBURNUM, Linn.

Characters of the Order.

V. punctatum, Ham; Fl. Br. Ind. iii. 5; Bedd. Fl. Syl. t, 217; Gamble Man. Tim 394 (under *V. acuminatum*); Brandis Ind. Tr. 362. Tam. *Kónakáran*. 311

Leaves 2-4 in. by 1-1½ in. ovate, acuminate at both ends, entire, glabrous. Petiole ½ in. Cymes terminal, erect, 2-4 in. across, flowers white, ¼ in. across, bracts small. Drupe ovoid ⅓ in. by ¼ in., seed grooved.

A small tree abundant in the evergreen forests at 3 6000 ft. Height 30 ft. Diameter 1 ft. Occurs also all up the Western Ghats, in Mysore and on the Neilgherries.

Flowers and fruits from October to April.

Gamble says that the bark is "brown, thin, tesselated in small" "elongated diamonds, wood light red, hard, close-grained. Pores" "very small, very numerous, uniformly distributed. Medullary" "rays very fine, very numerous."

With us the wood is only used for fuel.

ORDER XLV. RUBIACEÆ.

Trees with simple, entire, opposite, whorled, leaves, and interpetiolar stipules, often connate and forming a sheath. Flowers regular, bisexual (rarely diœcious, often dimorphic. Calyx-tube adnate to the ovary. Corolla tubular or rotate, lobes 4 9, valvate, imbricate or contorted. Stamens as many as corolla lobes, inserted on the corolla. Ovary inferior, 1-10 usually 2 celled, ovules solitary, few or many in each cell. Fruit a capsule, berry or drupe, 2-10-celled; albumen fleshy or horney.

A large Order of considerable importance containing 29 trees indigenous in Travancore. Its most important genus is "Cinchona" from the bark of many species of which quinine and other febrifugal alkaloids are extracted. Many species and varieties of "Cinchona"

flourish well in Travancore especially on the High Range. This Order contains the "Coffee" plant *Coffea arabica* from Abyssinia, the "Ipecacuanha" *Cephaelis Ipecacuanha* from Mexico, the "Gambier" *Uncaria gambier* from Burmah, the "Madder" *Rubia tinctorum* from Europe, and *R. cordifolia* from the Himalayas besides other plants of economic value.

Ovules two or more in each cell. (Except in Webera)
Flowers in dense, globose heads.
Ovaries confluent, forming a globose, fleshy mass ...1. *Sarcocephalus.*
Ovaries free common receptacle fleshy in fruit ...2. *Anthocephalus.*
Ovaries free, common receptacle dry in fruit.
Calyx segments clavate, stigma globose ...3. *Adina.*
Calyx-segments 0, stigma oblong ...4. *Stephegyne.*
Flowers not in dense globose heads.
Fruit a capsule.
Corolla-lobes valvate, seeds winged ...5. *Hymenodictyon.*
Corolla-lobes imbricate, seeds not winged ...6. *Wendlandia,*
Fruit a berry.
Inflorescence terminal.
Flowers 5-merous, anthers exerted ...7. *Webera*
Flowers 4 merous, anthers included ...8. *Byrsophyllum,*
Inflorescence axillary or leaf-opposed.
Stigma fusiform, ovary 1-celled ...9. *Gardenia.*
Stigma fusiform, ovary 2-celled ...10. *Randia.*
Stigma 2-lobed, ovary 2-celled ..11. *Diplospora.*

Ovules solitary in each cell.
Corolla-lobes valvate.
Flowers distinct
Ovules pendulous ..12. *Canthium.*
Ovules basilar erect ..13. *Psychotria.*
Flowers in confluent heads ..14. *Morinda.*
Corolla-lobes twisted.
Style longer than corolla, stigma 2-lobed ..15. *Ixora.*
Style twice as long as corolla, stigma entire ..16. *Pavetta.*

1. SARCOCEPHALUS. Afzel.

Trees with opposite leaves. Flowers in dense, globose heads on terminal peduncles Calyx-tube short with 4 or 5 imbricate teeth at the mouth. Corolla narrow-tubular, with 4 or 5 imbricate lobes Stamens 4 or 5, sub-sessile. Style long, stigma fusiform. Ovary 2 celled with many ovules. Fruits combined into a globose fleshy mass of 2-celled pyrenes, seeds ovoid, compressed, not winged.

312 1. **S. Missionis**, Wall; Fl. Br. Ind. iii. 27 (under *Nauclea Missionis*); Bedd. Fl. Syl. cxxix (under *N. elliptica*); Gamble Man; Tim 405; Brandis Ind. Tr. 366. Tam and Mal; *Attu vanji.*

Leaves 3-5 in. by 1-2 in. clustered at ends of the branches, lanceolate, acuminate, pale green, glabrous and shining, nerves 10-12 pair. Petiole ¼ in. Flower-heads 1½ in. diam, flowers yellowish-white, fragrant, ¼ in. long.

A small tree found on river-sides throughout Travancore from 0-1500 ft. Height 40 ft. Diam 1 ft. Found in Malabar and other parts of the Western coast.

Flowers in April—May. Fruits in Aug.—Nov.

Bark smooth. Wood dark yellow, moderately hard but rough and cross-grained. Pores small or moderate-sized, often divided. Rays fine and numerous.

W=37 lbs. P=430.

The wood is not much used, indeed, the tree does not grow to a sufficient size to make it likely to be much employed. Some timber merchants have tried it on the market without creating a demand for it.

2. ANTHOCEPHALUS, A. Rich.

Trees with large stipules and sessile flowers in dense, globose, terminal heads. Calyx-segments linear, persistent. Corolla-tube long, lobes 5, imbricate. Stamens 5 at mouth of corolla. Ovary 2-celled below, 4 celled above with numerous ovules in each cell. Style long. Fruit capsular, turbinate, 4-lobed, seeds numerous, not winged.

A. Cadamba, Miq; Fl. Br. Ind. iii. 23; Bedd. Fl. Syl. t. 35; Trimen Fl. Cey. ii. 293; Gamble Man Tim. 400; Brandis Ind. Tr. 367. Tam. *Vellei kadambu: kola ayila.* Mal. *Attu ték: kodavára: chakka.* 313

Leaves 5-12 in. by 3-6 in. ovate, shining above, pubescent beneath venation marked, about 14 pair. Petiole 1-1½ in. Flower-heads 1-2 in. diameter on stout peduncles. Flowers orange with white stigmas, fragrant, ½ in. long. Fruit the size of a small orange, yellowish green, seeds minute.

A large deciduous tree with a clean, cylindrical stem and horizontal branches, common at low elevations on river banks and in swamps but also found on the slopes of evergreen forests up to 1500 ft. Often cultivated for ornament. Height 70 ft. Diam. 2 ft. Occurs also throughout India and in Ceylon and Burmah.

Flowers May - July. Fruits August—September.

Bark ⅓ in. thick, dark grey, deeply cracked, wood yellowish-white, soft and even-grained. No heartwood. Pores large. scanty, sometimes in short radial lines. Rays fine, numerous and close together,

W=40 lbs. P=600 (Gamble)

The tree is of fast growth and is said to attain a girth of 5 feet in 16 years. I have never known it used in Travancore. but Gamble says that in N. India it is used for beams and rafters though it is a brittle wood. It is highly recommended for tea-boxes though its weight is half as much again as Cottonwood.

3. ADINA, Salisb.

Trees with large stipules and small flowers crowded in globose, axillary heads. Calyx-segments 5, clavate. Corolla-tube long, lobes 5, valvate. Stamens 5 at mouth of corolla. Style slender. Stigma clavate. Capsule small 2-celled seeds many, tailed at both ends.

314 **A. cordifolia**, Hook. f. Fl. Br. Ind. iii 24, Bedd Fl. Syl. t 33 (under *Nauclea cordifolia*); Trimen Fl. Cey. ii 293, Gamble Man. Tim. 401, Brandis Ind. Tr. 368. Tam and Mal. *Manja kadambu*.

Leaves 4-8 in. each way orbicular, cordate, shortly acuminate, glabrous above, pubescent beneath. Petiole 2-4 in. Flower-heads ¾ in across, solitary or in few-flowered panicles, peduncles 1-2 in. Flowers yellow, ⅙ in long, mixed with numerous filiform bracteoles Capsule ⅛ in long turbinate, very hairy.

A very large deciduous tree scattered through our deciduous forests from 0-1500 ft. but nowhere abundant. Height 100 ft. Diam. 4 ft. Occurs also throughout India, in Ceylon and Burmah.

Flowers in May—August. Fruits October—November.

Bark ½ in. thick, grey, rough. Wood yellow, moderately hard even-grained, no heart-wood. Annual rings faint. Pores small, numerous, evenly distributed. Rays very fine, numerous.

W=45 lbs. P=621.

An excellent wood for furniture and door-panels, taking a fine polish, it is specially recommended for cots: but it is not strong, and is apt to contract and warp; when well seasoned it lasts a long time. Gamble mentions that a piece of timber in a roof was perfectly sound after 40 years.

4. STEPHEGYNE, Korth.

Trees with large stipules and small flowers crowded in globose, terminal heads. Calyx-limb tubular, truncate, segments 0. Corolla tubular, lobes 5, valvate, acute. Stamens 5. at mouth of corolla. Stigma mitrœform, capsule 2 celled with many ovules. Seeds many, small winged

Leaves under 4 in. Calyx-limb very short	...	1. *S. parvifolia.*
Leaves over 4 in. Calyx-limb long and tubulur	...	2. *S. tubulosa.*

315 I **S. parvifolia**, Korth, Fl. Br. Ind. iii. 25; Bedd. Fl. Syl. t. 34 (under Nauclea parvifolia); Trimen Fl. Cey. ii. 294; Gamble Man. Tim. 403; Brandis Ind. Tr. 369. Tam. *Chinna kadambu*: *nir kadambu*. Mal. *Vimbu sira kadambu*.

Leaves 2-4 in by 1½-3 in ovate, apex obtuse,. with 6-10 pair of strongly marked veins, glabrous, apple-green above, pale beneath. Petiole ½ in. Flower-heads about 1 in. diam. with 2 leaves at the base. Flowers ½ in. long, creamy-white, fragrant, styles white. Capsules ⅛ in- with 10 blunt, vertical ribs.

A tall and slender tree scattered all over our forests from 0-2000 ft, but nowhere abundant Found in deciduous as well as in evergreen forest and coming up readily in abandoned land, Height 70 ft. Diam. 2 ft, rarely 3 ft. Occurs also all over India and in Ceylon and Burmah.

Flowers in June—July. Fruits in September.

Bark ⅓ in. thick, light grey' smooth, flaking off. Wood light pinkish-brown, moderately hard, even-grained Pores small, numerous, uniformly distributed. Rays very fine, numerous.

W=39 lbs. and P.=656.

A very good wood. much resembling that of *Adina cordifolia* but redder. It is used for furniture and building in the same way at the last named tree. The Hillmen use it for bows. It is durable if not wetted.

2, **S tubulosa,** Hook. f. ; Fl. Br. Ind. iii. 25 ; Bedd. Fl Syl cxxviii ; Trimen Fl Cey i. 295 ; Gamble Man. Tim. 404. Brandis Ind. Tr. 369. Mal. *Malan thumba* 316

Leaves 4-8 in by 2½-5 in broadly ovate, rounded at base, acute, glabrous, veins prominent beneath, 10-12 pair, stipules very large, broadly oval. Petiole ½-¾ in Flower-heads 1½ in diam. Calyx-limb long, tubular Flowers ½ in. long, purplish-pink. Capsule in., ovoid, 10-ribbed, seeds long.

A small tree extremely like the last and not easily distinguishable from it except when in flower, occuring in evergreen as well as in deciduous forest. Height 50 ft. Diam. 1½ ft. Found also in Ceylon and Cochin

Flowers in June –July. Fruits in September.

Bark 1 in. thick, dark green, smooth. Wood pinkish-brown moderately hard. No heart-wood. Pores few, small and medium sized. Rays fine, numerous.

W. = 56 lbs- (Gambles gives W. =42.) P=553.

The wood is similar to the last named, and is used for the same purposes.

5. **HYMENODICTYON,** Wall.

Trees with thick branches and bitter bark. leaves long-petioled, stipules large. Flowers small in simple or compound racemes with 1-2 leafy, persistent bracts. Calyx-tube short, segments 4. Corolla funnel shaped. lobes 5, valvate. Stamens 5, inserted within the tube. Ovary 2-celled, style slender, stigma fusiform, Capsule 2-valved with many winged seeds.

Leaves soft-downy. Racemes pendulous, cross-armed, 6-10 in. long...1 *H. excelsum*

Leaves glabrous. Racemes erect, simple, 2-3 in. long 2. *H. obovatum.*

1. **H excelsum,** Wall ; Fl. Br. Ind. iii. 35, Bedd. Fl. Syl. cxxx (under *H excelsum* add *H utile*), Gamble Man. Tim. 406, Brandis Ind. Tr. 371. Tam. *Vellei kadambu.* Mal. *Itthilei* ; *malam kalli* ; *nichan kadambu; peran tholi.* 317

Leaves 5-10 in. by 4-8 in., broadly ovate, abruptly acuminate, narrowed to the base, softly-pubescent, yellowish-green, veins marked by white lines, 7-10 pair. Petiole 3-8 in. Flowers ¼ in. long, pale green, fragrant, in long terminal and axillary cross-armed racemes. Capsules 1 in. long, dark brown, covered with white specks, seeds minute.

A medium-sized tree very common in deciduous forests from 0-1500 ft. Height 60 ft. Diam. 1½ ft. Widely distributed through India, Burmah, Tonkin and Java but not in Ceylon.

Flowers in June to July. Fruit ripens March to April.

Bark $\frac{1}{2}$ in. thick, blackish-grey, cracked into small squares, Wood white when freshly cut, turning brownish grey, soft and smooth. Pores few, of medium size. Rays of two kinds, moderately broad and fine.

W=28 lbs. P=447.

The wood is not used in Travancore. Gamble says "the wood is" "soft, but of good quality for purposes for which a soft wood is" "useful. It would do for tea-boxes, and is in use for scabbards," "grain-measures, palanquins, toys. and in Burma for school-slates" "and packing-cases". Beddome says that it is called Bastard cedar at Palghaut, and it is much in use there for cabinet-making. The bark is bitter, and it has been recommended as a febrifuge, but the natives do not acknowledge any medicinal value in it.

2. H. obovatum, Wall: Fl. Br, Ind. iii. 36. Bedd. Fl Syl. t.
318 219 , Gamble Man. Tim. 407, Brandis Ind. Tr. 372.

Leaves 3-4 in- by 2-2$\frac{1}{2}$ in. obovate, suddenly acuminate, glabrous on both sides except the axils of the nerves beneath. Petioles 1$\frac{1}{2}$-2 in. Flowers white, fragrant, in terminal, erect racemes 2-3 in. long. Capsules $\frac{1}{2}$ in. long. brown, ovoid.

A small or medium-sized tree of the deciduous forests up to 2.000 ft. and much less common than the last named. Height 40 ft. Diam. 1 ft. confined to the western coast from Bombay southwards.

Beddome says that the timber is used by the natives for a variety of purposes. It has not been tested or weighed.

6. WENDLANDIA, Bartl.

Trees with leaves opposite or whorled in threes. Flowers small in terminal, thyrsoid panicles. Calyx-segments 5. small. Corolla tubular, 5 lobed, lobes imbricate. Stamens 5 inserted between the corolla lobes. Style long. Stigma bi-lobed. Capsule globose, 2-celled containing many minute. flat seeds.

Leaves 1. in. broad, hairy beneath; stipules recurved 1. *W. Notoniana.*
Leaves under 1 in. broad, glabrous beneath; stipules straight. acute .. 2. *W. angustifolia*

W. Notoniana, wall Fl. Br. Ind. iii. 40. Bedd. Fl. Syl. t. 224:
319 Gamble Man, Tim. 409. Brandis Ind. Tr. 371. Tam. *Kadamban vellei thila chedi: puvu.*

Leaves 3-5 in. by 1-1$\frac{1}{2}$ in. whorled in threes, lanceolate, acute, narrowed to the base, pale green, hairy beneath, coriaceous, nerves about 8 pair. Petiole $\frac{1}{4}$ in Flowers in erect, pyramidal panicles, each $\frac{1}{3}$ in. long, fragrant, pale yellow. Capsule small.

Very abundant on land that has been cultivated and abandoned, and in open forests from 500-6000 ft. It is usually a small tree of 20 ft. high and 6 in diameter, but in suitable localities it attains a height of 50 ft. and a diam of 2 ft. Found also in Tinnevelly, in the Deccan and in Ceylon.

Bark brown marked with vertical lines, inner bark orange-red. wood dark reddish-brown, moderately hard, even-grained. Pores small, evenly distributed. Rays fine and numerous.

W=53 lbs. (Gamble)

Not used in Travancore, but in Ceylon it is regarded as a very good wood, and extremely useful for the posts of small buildings and similar work though it does not attain a large size. The tree is most useful in reclaiming land, and if coppiced, throws up straight shoots which grow rapidly. It is a good fuel.

2. **W. angustifolia,** Wight, Fl. Br. Ind. iii. 40, Gamble Man. Tim. 408. Brandis Ind. Tr. 374. 320

Leaves 3-4 in. by $\frac{1}{3}$-$\frac{2}{3}$ in. very glabrous, linear-lanceolate. acute. stipules straight, acute. Flowers similar to the last.

A small tree, very similar to *W. Notoniana*, and found in similar localities but considered a distinct species. Occurs also in Tinnevelly.

7. WEBERA, Schreb.

Trees with opposite, petioled leaves. Flowers in terminal, paniculate cymes. Calyx-limb short, segments 5. Corolla-tube short, lobes 5, twisted in bud. Stamens 5, inserted at mouth of corolla, subsessile, anthers exserted. Ovules 1 or more in each cell. Fruit a 2-celled berry, seeds few.

Ovules 2 or more in each cell .. .. .. 1. *W. corymbosa.*

Ovules solitary in each cell .. .. .. 2. *W. lucens.*

1. **W. corymbosa,** Willd Fl. Br. Ind. iii. 102. Bedd. Fl. Syl. cxxxiii. (under *W. asiatica*). Trimen Fl. Cey. ii. 328. Gamble Man. Tim. 411. Brandis Ind. Tr. 377. Tam, *Kurá* : *paretti.* 321

Leaves 3-8 in. by 1-3 in. lanceolate-oblong, acute at both ends, glabrous and shining, rather thick stipules acute, often sheathing. Petiole $\frac{1}{2}$ in. Flowers white, $\frac{1}{2}$ in. across, in terminal trichotomous cymes about 2 in. across. Berry about $\frac{1}{3}$ in diam., globose, glabrous, dull green turning black. Seeds 2-8 in each cell.

A large shrub or small tree common in the evergreen forests from 1000-4000 ft. Height 20 ft. Diam. 8 in. Found also in the Bombay Presidency, Western Ghats, Ceylon and Malay Islands.

Flowers and fruits February—April and in September—October.

Wood light-brown, hard, close and even-grained. Pores very small and very numerous. Rays short, fine and very fine.

W = 61 lbs.

The wood is very hard and strong. but is of small size. Trimen says that it is used in the construction of granaries.

2. **W. lucens,** Hook f. ; Fl. Br. Ind. iii. 106, Bedd. Fl. Syl. cxxxiv. 8 (under *Paretta sp.*), Gamble Man. Tim. 411. Brandis Ind. Tre.s 378. 322

Leaves 2-3 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. oblong-lanceolate, black and shining when dry. Petiole $\frac{1}{4}$ in. Flowers white, $\frac{1}{3}$ in. across, in terminal cymes 1 in. across. Fruit $\frac{1}{3}$ in. diam. with 1 seed in each cell.

A small tree up to 20 ft. high and 6 in. diam. not uncommon in evergreen forests from 500-5000 ft. Found also on the Neilgherries.

Flowers and fruits February- April and in September-October.

The wood has not been examined.

8. BYRSOPHYLLUM, Hook. f.

Glabrous trees with large deciduous stipules. Flowers large, diœcious, in small, terminal cymes. Calyx-limb truncate. Corolla-tube long, contracted at mouth, lobes 4, twisted in bud Stamens 4, included in corolla-tube, anthers sessile. Ovary 2-celled with numerous ovules. Fruit a 2-celled berry, seeds few, immersed in pulp.

323 **B. tetrandrum**, Hook. f.; Fl. Br. Ind. iii. 107; Bedd. Fl. Syl. t. 326; Gamble Man. Tim. 411; Brandis Ind. Tr. 378.

Leaves 3-5 in. by $1\frac{1}{2}$-2 in. obovate, or oblong, tip rounded, very dark green and shining above. Petiole stout, $\frac{1}{2}$-1 in. Flowers 1-3 together, white tinged with rose, $1\frac{1}{2}$ in. long. Berry ovoid, dark green, shining, $\frac{3}{4}$ in. diam.

A small tree found in the evergreen forests at 2000-5000 ft. in S. Travancore, not observed elsewhere. Height 20 ft. Diam. 8 in. Endemic.

Flowers in September-October.

The wood is unknown.

9. GARDENIA, Linn.

Trees armed or not, with opposite or whorled leaves, stipules often connate. Flowers terminal or axillary, often dimorphic or polygamous. Calyx-limb tubular or dilated. Corolla-lobes 5-12, twisted in bud. Stamens as many as corolla-lobes, inserted in the tube. Ovary 1-celled, with many ovules Stigma fusiform. Fruit large, fleshy, endocarp bony, seeds numerous, packed in pulp.

324 **G. turgida**, Roxb; Fl. Br. Ind. iii. 118, Bedd. Fl. Syl. cxxxiv, Trimen Fl. Cey, ii. 333, Gamble Man. Tim. 416, Brandis Ind. Tr. 380.

Leaves 3-4 in. by 1-2 in. obovate-oval, tapering to base, crowded at ends of branches, sessile, glabrous, with or without spines. Flowers 1-4 together, white, fragrant, 1 in long and 1 in across Fruit 1-3 in. globose, greyish-brown. endocarp, splitting into 5 valves

A small deciduous tree not seen by me but found by Lawson in S. Travancore in the drier parts. Height 25 ft. Diam 1. ft. Occurs throughout India, Ceylon and Burmah.

"Bark smooth, bluish-grey 1/5 in thick. Wood close-grained," "hard, white with a purplish tinge. no heartwood. Annual rings" marked by a dark line with few pores. Pores very small, scanty." "Rays fine and very fine, very numerous."

"W=56 lbs."

"Growth slow, 13 rings per inch. The wood is good." (Gamble)

10. RANDIA.

Trees unarmed or spinous, one leaf of opposite pairs often absent. stipules small, triangular. Flowers often dimorphic, solitary and at end of suppressed branchlets, or in leaf-opposed cymes, Calyx-limb short, wide. Corolla-lobes 5, usually longer than tube, twisted in bud. Stamens 5, anthers long, exserted. Ovary 2-celled, stigma fusiform. Fruit a 2-celled berry with numerous seeds immersed pulp.

Spinous trees. Flowers at end of suppressed branchlets.
Flowers over $1\frac{1}{2}$ in.; fruit over 2 in . 1. *R. uliginosa.*
Flowers and fruit both under 1 in. . 2. *R. dumetorum,*
Unarmed trees. Flowers in axilary and leaf-opposed cymes . 3, *R, Gardneri.*

1. **R uliginosa**, DC, Fl. Br. Ind. iii 110, Bedd. Fl. Syl. cxxxii, Trimen Fl. Cey. ii 330, Gamble Man. Tim. 412, Brandis Ind. Tr, 381. Tam. and Mal. *Kárei* 325

Leaves 1-8 in. by $\frac{1}{2}$-4 in. spathulate-oblong, tapering to base very glabrous, spines short and straight, terminating brachlets. Petiole $\frac{1}{4}$ in. Flowers white and fragrant, sessile or peduncled, $1\frac{1}{2}$-2 in. across, borne singly or in pairs at ends of branchlets. Fruit ovoid, smooth, pale brown, $1\frac{1}{2}$-3 in long, seeds compressed, smooth.

A small deciduous tree common in the open forests of the low country. Height 25 ft. Diam. 8 in. Occurs throughout India and in Ceylon and Burmah.

Flowers in March-April.

"Bark $\frac{1}{3}$ in. thick, reddish-brown, wood whitish-grey, hard and" "close-grained, no heartwood. Annual rings marked by a narrow" "belt without pores. Pores small and very small, numerous. Rays" "fine and very fine, very numerous.", (Gamble).

W. = 48 lbs. (Gamble's average).

The wood is not used, but Gamble says that it may prove a substitute for boxwood. The fruit is said to be eaten, but it is astringent. (Trimen). It is used in dyeing as a colour-intensifier.

2. **R, dumetorum**, Lam., Fl. Br. Ind. iii, 110, Bedd. Fl. Syl, cxxxii, Trimen Fl. Cey. ii, 330, Gamble Man. Tim. 413, Brandis Ind. Tr. 382. Tam. *Malam kárei.* 326

Leaves 1-2 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in obovate-oval, tapering to base, glabrous or pubescent, nearly sessle, stipules acuminate, spines long and stout, axillary. Flowers yellowish-white, fragrant, solitary or a few together $\frac{1}{2}$-$\frac{3}{4}$ in. across. Fruit about 1 in. long, ovoid or globose, yellow, seeds flat.

A small tree common in the drier forests about Puliyara and in S. Travancore Height 30 ft. Diam. 1 ft. Throughout India, Ceylon and Burmah.

Flowers in March-May. Fruits May-June.

" Bark grey, wood white or pale brown, hard and close-grained"
" Annual rings marked by a belt without pores. Pores very small "
" Rays fine and very fine, very numerous." (Gamble).

W=54 lbs. (Gamble).

The wood is not used in Travancore except for fuel, but elsewhere it is employed for agricultural implements. The bark and fruit are used in native medicine, and the unripe fruit for poisoning fish. The fruit yields a yellow dye.

327 3. **R. Gardneri,** Thw. : Fl. Br. Ind. iii. 112, Bedd. Fl. Syl. cxxxii, Trimen Fl. Cey. ii. 331, Gamble Man. Tim. 414, Brandis Ind. Tr. 383. Tam. *Padarappan.*

Leaves 3-6 in by ¾-2 in lanceolate, acuminate, narrowed to base glabrous, veins distant, 6-7 pair. Petiole ¼-½ in. Flowers white in leaf-opposed cymes, numerous, each ⅓ in. long and ¼ in. across, bracts small, persistent. Fruit globose, green, ⅓ in. diam.

An unarmed tree of medium size common in evergreen forests about Kulathupuzha and Ariyankavu from 500-1500 ft. Height 70 ft. Diam 1½ ft. Found also in Ceylon.

Flowers in February-May. Fruit June-August.

Bark greyish-brown, mottled, ⅓ in. thick. Wood light yellowish-brown, smooth, close-grained, moderately hard, breaking with a long fracture. No heartwood. Pores small, evenly distributed. Rays fine, numerous.

W=58 lbs. P=877.

An excellent wood taking a fine polish, but not used at all.

11, DIPLOSPORA, DC.

Evergreen trees with shortly petioled leaves, stipules triangular, acuminate. Flowers polygamo-diœcious in axillary or leaf-opposed fascicles. Calyx-tube short, limb truncate or 4-5 toothed. Corolla-tube short, lobes 4-5 spreading, twisted in bud. Stamens 4-5-anthers exserted. Style bifid. Ovary 2-celled with 2-3 ovules in each cell. Fruit a berry, seeds few.

328 **D. apiocarpa,** Dalz., Fl. Br. Ind. iii. 123, Bedd, Fl. Syl. cxxxiv, Gamble Man. Tim. 418, Brandis and Ind. Tr. 384.

Leaves 2-7 in. by 1-3 in. pale green, glabrous, elliptic-lanceolate veins distant, about 4 pair. Petiole ½ in. Flowers 4-merous yellowish white, fragrant, numerous, ⅓ in. across. Fruit globose, 1 in. diam.

A tree of medium size common in evergreen forests between 3000-5000 ft. Height 50 ft. Diam. 1 ft. Occurs in the hill forests of the Western Coast.

Flowers and fruit April-May.

The timber has not been examined, but it is probably white, hard and close-grained, like that of other species of this genus.

Guettarda speciosa, Linn. A small tree akin to the above, with very fragrant white flowers, is cultivated in gardens.

12. CANTHIUM, Lam.

Unarmed or spinous trees with connate, broadly triangular, acute stipules. Flowers small in axillary cymes or fascicles. Calyx-tube short, 4-5 toothed. Corolla-tube campanulate, lobes 4 or 5, valvate, reflexed. Anthers 4-5, subsessile on the mouth of the corolla. Stigma large, capitate. Ovary 2-celled, with 1 pendulous ovule in each cell. Fruit a drupe more or less didymous, with 1 or 2 pyrenes.

Flowers 5-merous.
- Fruit on long pedicels.
  - Leaves stout, coriaceous. Fruit $\frac{1}{3}$ in.
    - Leaves ovate. Flowers corymbose on slender peduncles . . 1. *C. didymum.*
    - Leaves lanceolate. Flowers umbellate on stout peduncles . . 2. *C. umbellatum.*
  - Leaves thin, papery. Fruit over 1 in. . . 3. *C. pergracile.*
- Fruit sessile . . 4. *C. neilgherrense*

Flowers 4-merous . . 5. *C. travancoricum.*

1. **C. didymum**, Roxb., Fl. Br. Ind. iii. 152, Bedd. Fl. Syl. t. 221. Trimen Fl. Cey. ii. 343, Gamble Man. Tim. 419; Brandis *Ind.* Tr. 385. Tam. *Irámbaráttthan* : 329

Leaves $1\frac{1}{2}$-$4\frac{1}{2}$ in. by $\frac{3}{4}$-2 in. ovate, acuminate, glabrous, bright green above, paler beneath, very coriaceous, veins few. Petiole $\frac{1}{4}$-$\frac{1}{3}$ in. Flowers white, $\frac{1}{4}$ in. long on long pedicels, corymbose on slender peduncles. Drupe didymous, black, $\frac{1}{3}$ in. long.

A small evergreen tree abundant in the low country all through Travancore. Height 30 ft. Diam. 1 ft. Occurs through India, Ceylon Malaya and China.

Flowers April to August. Fruits July-October.

Bark dark-grey, smooth, but marked with vertical lines. Wood light brown, hard and close grained. Pores very small, numerous and evenly distributed. Rays fine and very fine, numerous.

W = 53 lbs.

The wood is strong and serviceable but apt to split.

2. **C. umbellattum,** Wight: Fl. Br. Ind. iii. 132: Bedd. Fl. Syl. t. 221 (under *C. didymum*); Gamble Man. Tim. 419; Brandis Ind. Tr. 385. Tam. *Nallamanthanam*. Mal. *Nányul*. 330

Leaves 3-4 in. by $1\frac{1}{4}$ in. lanceolate, tapering to both ends, very dark green, glabrous and coriaceous. Flowers white, $\frac{1}{3}$ in. long, in compact umbels from short, stout peduncles. Drupe ovoid $\frac{1}{3}$ in. long, black, on slender 1 in. pedicels.

A handsome evergreen tree of the forests of the hills from 3000-6000 ft., but a shrub at lower elevations. Height 40 ft. Diam 1 ft. Also found on Western Ghats.

Flowers and fruits Dec-May.

The timber has not been weighed or tested, but it is pale yellow, and very strong and tough. Young shoots make splendid walking sticks and when stripped of their back show numerous longitudinal lines. The fruit is eaten by the Hillmen.

331 3. **C. pergracile**, Bourdillon: Jour. Bomb. Nat. Hist. Soc. xii: 352. Mal. *Palaga: ánei kumbi.*

Leaves 2-4 in. by $\frac{3}{4}$-$1\frac{1}{4}$ in. lanceolate with a long acumination, tapering to base, dark green and very glossy, very thin. Petiole $\frac{1}{4}$ in Flowers greenish-yellow, $\frac{1}{4}$ in. long and broad, 10-20 together in axillary cymes, pedicels slender. Fruit didymous, dark green, smooth $\frac{3}{4}$-1 in.

A very graceful straight-stemmed tree found in the evergreen forests about Kulathupuzha at 500 ft. rare. Height 80 ft. diam. $1\frac{1}{2}$ ft. Endemic.

Flowers Feb. Fruits Aug.-Sep.

Bark light brown, rather rough, $\frac{1}{4}$ in. thick. Wood pale brown straight-grained, moderately hard, no heartwood. Pores small and numerous. Rays fine, distinct and regular. Annual rings marked by dark lines about 16 to inch.

W=50 lbs. P=870.

The wood of this tree is not used, but it is good.

332 4. **C neilgherrense**, Wight: Fl. Br. Ind. iii. 133; Bedd. Fl. Syl. cxxxiv-6 Gamble; Man. Tim. 419: Brandis Ind. Tr. 385.

Leaves 3—5 in. by $1\frac{1}{4}$—$2\frac{1}{2}$ in ovate, acuminate, glabrous above, hairy beneath. Petiole $\frac{1}{4}$ in. Flowers small, white, very hairy, in sm ll umbels, sessile on a very short peduncle, Fruit ovoid $\frac{1}{3}$-$\frac{2}{3}$ in. long, succulent, pericarp thin.

A small tree of the evergreen forests between 3000-6000 ft. rare Height 30 ft Diam. 1 foot. Found also on the Neilgherries and Tinnevelly hills.

Flowers December-April. Fruits June-August.

The timber of this tree has not been examined but it is probably hard and serviceable.

333 5 **C. travancoricum**, Bedd.; Fl. Br. Ind. iii. 134; Bedd. Fl. Syl. cxxxiv-6; Brandis Ind. Tr. 385.

Leaves $1\frac{1}{2}$-2 in. by $\frac{3}{4}$-1 in. ovate, acuminate, glabrous, dark green above, paler beneath. Petiole, $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers 1/10 in. across, white, 4-merous, in many-flowered cymes, peduncles stout $\frac{1}{4}$-1 in. pedicels long and slender. Fruit unknown.

A medium-sized evergreen tree found by Beddome on the Tinnevelly and Travancore, hills, not seen by me.

13. PSYCHOTRIA, Linn.

Small trees with opposite (rarely whorled leaves and small flowers in terminal cymes. Calyx-tube short. Corolla-tube short, lobes 5, rarely 4-6, valvate Stamens inserted on the mouth of the corolla. Ovary 2 celled style bifid, ovules solitary, erect from the base. Fruit small, composed of two 1-seeded pyrenes.

334 1. **P. anamallayana**, Bedd.: Fl. Br. Ind. iii. 171; Brandis Ind. Tr. 395.

Leaves 6-10 in. by $1\frac{1}{2}$-3 in. spathulate or oblanceolate, abruptly acuminate, tapering to the base, glabrous. Petiole $\frac{1}{3}$ in. Flowers white in terminal cymes 6-8 in. long. Fruit cylindrical, purple, $1\frac{1}{2}$ in. long.

A small tree found in the evergreen forests of Peermade 3000-4000 ft. also on the Anamallays. Height 20 ft. Diam. 6 in. Properties unknown.

14. MORINDA Linn.

Small trees with broad, connate stipules. Flowers in dense, confluent heads, leaf-opposed or terminal. Calyx-tube short, segments usually 0. Corolla tubular, lobes 4 or 5, valvate. Stamens 4 or 5, anthers oblong, subsessile. Ovary 2-or spuriously 4-celled with one ascending ovule in each cell. Stigmas 2, linear. Fruit compressed into a fleshy, globose mass containing 3 or 4 pyrenes.

Leaves oval, shining, over 6 in. long ... ... 1. *M. citrifolia.*
Leaves lanceolate, dull, less than 6 in. long ... ... 2. *M. tinctoria.*

1. **M. citrifolia,** Linn.: Fl. Br. Ind. iii. 155 ; Bedd. Fl. Syl. t. 335
220 ; Trimen Fl. Cey. ii. 354 ; Gamble Man. Tim. 422 ; Brandis Ind. Tr. 392. Eng. The Indian mulberry : Togari-wood of Madras. Mal. *Manjanáthhi.*

Leaves 6-10 in. by 4-6 in. attenuate at base, shining, bright apple green, veins strongly marked, stipules obtuse, persistent. Petiole stout, $\frac{1}{2}$ in. Head of flowers ovoid, over 1 in. long, solitary or 2 or 3 together, flowers white. Head of fruit fleshy, white, containing about 4 compressed pyrenes, winged on one side. Some of the enlarged calyces of the fruits develop large leafy segments.

A small tree common on the banks of canals and rivers in the low country near the sea, possibly not indigenous. Height 25 ft. Diam. 10 in. Occurs and is cultivated in many parts of India, in Ceylon, N. Australia and elsewhere.

Flowers and fruits in October.

Bark yellowish white. The timber has not been examined.

"The root-bark affords a red dye" (Trimen). The tree used to be regularly cultivated in the Madras Presidency for the dye from the roots, but the cultivation has ceased as it no longer pays.

2. **M. tinctoria,** Roxb.; Fl. Br. Ind. iii. 156 ; Trimen Fl. 336
Cey. ii. 354 ; Gamble Man. Tim. 422 ; Brandis Ind. Tr. 392. Tam. *Nuna.* Mal. *Manjanatthi.*

Leaves 3-6 in. by 1-$2\frac{1}{2}$ in. lanceolate, acute at both ends, slightly glabrous, dull green, not shining, stipules acute, deciduous. Petiole $\frac{1}{4}$ in. Flower heads globose, $\frac{3}{4}$ in. long, few together, flowers white fragrant. Head of fruit fleshy, globose about $\frac{3}{4}$ in. diam. Pyrenes 4, oblong.

A tree of moderate height but often attaining a considerable girth, abundant all over the low country of Travancore, especially near villages, thrives best in the drier parts. Height 30 ft. Diam. $1\frac{1}{2}$ ft. Found throughout the South of India, in Bengal, Assam and Ceylon.

Flowers and fruits September-October.

Bark corky, brittle, pale brown, deeply cracked. "Wood red," "often yellow with red streaks, moderately hard, close-grained." "Annual rings faintly marked. Pores small, scanty, in radial or" "oblique groups, rather distant from each other. Rays fine and" "moderately broad, rather distant." (Gamble).

W=41 lbs. P=410.

"The wood is handsome and durable. It is used for plates and" "dishes. The bark of the root is largely used for dyeing red and" "yellow, and is the dye used for red thread for carpets, turbans &c." (Gamble).

15. IXORA, Linn.

Small trees with cuspidate persistent stipules. Flowers numerous in terminal cymes. Calyx-tube ovoid, limb 4-toothed. Corolla-tube long, very slender, lobes 4, spreading, twisted in bud. Stamens 4, filaments short or 0. Ovary 2-celled, with 1 ovule in each cell. Style slightly exserted, stigmas 2. Fruit globose with 2 pyrenes.

Calyx-teeth longer than tube ... ... 1. *I. Notoniana*

Calyx-teeth equal or shorter than tube.

Leaves oblong, coriaceous. Inflorescence paniculate.. 2. *I. parviflora.*

Leaves thin, lanceolate. Inflorescence corymbiform... 3. *I. nigricans.*

337 1. **I. Notoniana**, Wall.; Fl. Br. Ind. iii 139; Gamble Man. Tim. 420; Brandis Ind. Tr. 388. Tam. *Kalilambili*. Mal. *Iramburippi*.

Leaves 6-8 in. by 1-3 in. oblong, obtuse, base acute or obtuse, very coriaceous, glabrous. Petiole $\frac{1}{2}$ in. Flowers red, $\frac{1}{3}$ in. long calyx-teeth longer than its tube, cymes up to 6 in. across. Fruit glabrous $\frac{1}{3}$ in. diam.

A small tree of the evergreen forests from 3000-6000 ft. Height 30 ft. Diam. 10 in. Found also on the Neilgherries and Palnies.

Flowers and fruits February—May.

Bark brown, rough, $\frac{1}{4}$ in. thick. Wood reddish-brown, hard and close-grained. Pores few, small. Rays numerous, fine moderately broad.

W.=58 lbs.

Excellent for fuel but not otherwise used.

338 2. **I. parviflora**, Vahl: Fl. Br. Ind. iii 142: Bedd. Fl. Syl. t. 222; Trimen Fl. Cey. ii 348; Gamble Man. Tim. 421; Brandis Ind. Tr. 388. Eng. The *Torch tree.*

Leaves 2-5 in. by 2-3 in. oval oblong or obovate, round at base, shortly accuminate, glabrous, dark-green, and shining above. Petiole stout, $\frac{1}{3}$ in. Flowers white, $\frac{1}{4}$ in. long, in trichotomous cymes arranged in a terminal panicle. Fruit black, succulent, $\frac{1}{4}$ in. diam.

A very common evergreen tree of the low country forests up to 1000 ft. Height 30 ft. Diam. 8 in. Common through the Madras Presidency, in Ceylon and Burmah.

Flowers and fruits from January—May.

Bark ¼ in. thick, brown. Wood light reddish-brown, smooth, very hard and close-grained. Pores small, evenly distributed. Rays very fine, very numerous and regular.

W=55 lbs. P=623.

The wood might be useful for engraving and turning as it does not readily split, but in Travancore it is not used except for fuel. "The green branches are used for torches." (Gamble).

3. I nigricans, Br.; Fl. Br. Ind. iii. 148; Bedd. Fl. Syl. cxxxiv; Gamble Man. Tim. 420; Brandis Ind. Tr. 389. 339

Leaves 2-6 in. by 1-2½ in. lanceolate, acuminate, generally narrowed to base, glabrous, dark green, thin and drying black. Petiole ¼ in. Flowers white, ⅓ in. long, in corymbiform cymes. Fruit ¼ in. diam. black.

A small tree or large shrub of the evergreen forests both in the low country and on the hills, up to 4000 ft. Height 20 ft. Diam. 6 in. Occurs also on the Western Ghats, and in Pegu Burmah and the Malay Archipelago.

Flowers and fruits Jan-May.

Nothing is known of the wood or its properties.

16. PAVETTA, Linn.

Small trees, stipules often connate into a sheath. Flowers numerous in terminal and axillary cymes. Calyx-segments 4 Corolla with a long tube lobes 4, twisted in bud. Style very long, at least twice as long as the corolla-tube, stigma entire.

P. indica, Linn Fl. Br. Ind. iii. 150; Fedd. Fl. Syl. cxxxiv. 7; Trimen Fl. Cey. ii. 349; Gamble Man. Tim. 421; Frandis Ind. Tr. 387; Tam. *Pávattei* 340

Leaves 3-8 in. by 1-3 in. ovate-oblong or lanceolate, acuminate, tapering to base, glabrous on both sides or sometimes tomentose beneath, stipules short and broad. Petiole ¼-½ in. Flowers white, fragrant, very numerous, in corymbose cymes, corolla-tube ½ in. long style exserted fully ¾ in. Fruit globose, black, about ½ in. diam.

A small tree or large shrub common in evergreen forests from sea level to 3000 ft., very variable. Height 20 ft. Diam 6 in. Occurs through India, Ceylon, Burmah and the Andaman Islands, also in Queensland and China.

Flowers and fruits in February—May.

"Bark thin, smooth, brownish-grey. Wood white to light-brown," "hard close-grained. Pores very small, scanty. Medullary rays" "short, numerous, fine and very fine." (Gamble).

W.=53 lbs. (Gamble's) average

In Travancore no use is made of this tree. The root is slightly bitter and has aperient and diuretic properties, and is largely prescribed by native doctors in other parts of India. (Dict. Econ. Prod.)

ORDER XLVI COMPOSITÆ.

Trees, shrubs or herbs with alternate, rarely opposite leaves without stipules. Flowers very small, bi or unisexual, closely packed in heads surrounded by an involucre of bracts. Calyx-tube adnate to the ovary, limb usually consisting of hairs or scales, or absent. Corolla (sometimes absent) tubular with 5 valvate lobes, or ligulate Stamens 5 on the corolla-tube, filaments free, anthers connate into a. tube Ovary one-celled, crowned with a disk, with a solitary, erect ovule, style bifid Fruit an achene, crowned by the pappus. No endosperm.

A very large Order containing about 10 per cent of all known flowering plants (Trimen). It consists chiefly of shrubs and herbs including many vegetables such as the "Lettuce" *Lactuca sativa* and the "Artichoke" *Cynara scolamus*, the tonic "Wormwood" *Artemisia absinthium*, the medicinal *Arnica montana* the useful "Sunflower" *Helianthus annuus* and the "Til," *Guizotia oleifera* It also includes very many vegetable pests in the shape of weeds, which, owing to the enormous number of seeds which, they produce, spread everywhere in profusion Only two Travancore trees belong to it.

VERNONIA, Schreb.

Herbs and shrubs rarely trees with simple, alternate leaves Flower heads in terminal cymes, involucre cup shaped. Flowers all tubular and bisexual· Corolla lobes narrow. Anther cells not tailed at the base· Style arms subulate. Fruit usually ribbed, crowned by a pappus of many hairs.

Leaves quite entire: underside of leaf, petiole and inflorescence tomentose ... 1. V. *arborea*.

Leaves undulate underside of leaf, petiole and inflorescence glabrous ... 2. *V. travancorica*.

341 **1. V. arborea,** Ham.; Fl. Br. Ind. iii. 239; Bedd. Fl. Syl. t. 226 (under *Monosis Wightiana*); Gamble Man. Tim. 426 Brandis Ind. Tr. 399. Tam. *Shutthi*. Mal. *Kadavári*: *eerakathira*: *malánperuva*.

Leaves 4-8 in by 2-3 in. lanceolate or oblong-lanceolate, acute or rounded at base, acuminate, entire glabrous above, covered with grey or brown tomentum beneath. Petiole $\frac{1}{2}$ in. stout, tomentose. Flowers purple in large terminal, tomentose panicles. Achene $\frac{1}{12}$ in. long with a pappus of white hairs $\frac{1}{3}$ in.

A very showy small tree common at elevations between 1000 – 4000 ft., sometimes planted for ornament. Height 30 ft. Diam. 9 in. Occurs also in Bengal, Neigherries, Ceylon and elsewhere.

Flowers and fruits Jan-March.

Beddome says that the wood is soft and worthless, but this is not the case.

"Bark $\frac{1}{4}$ in, thick, brown, marked with vertical lines. Wood moderately hard, pale brown smooth and straight grained. Pores small, abundant, evenly distributed. Rays long, fine and numerous.

W=41 lbs. P= 391 "

342 **2. V. travancorica,** Hook. f.; Fl. Br. Ind. iii 240; Bedd. Fl. Syl. t. 225 (under *V. volkameriæfolia*): Gamble Man. Tim. 426; Brandis Ind. Tr. 399. Tam. *Thénpú*.

Leaves 2-6 in. by 1-4 in. obovate or ovate, undulate towards the tip, obtuse. tapering to base. glabrous on both sides. Petiole $\frac{1}{2}$ in.

slender, glabrous Flowers in terminal, glabrous panicles. Achene ¼ in. pappus of white hairs ⅓ in.

A small tree found only in the evergreen forests at high elevations 3000 ft. and upwards. Height 30 ft. Diam. 9 in. Endemic in Travancore.

Flowers and fruits Jan-March.

Beddome says that its timber is soft and worthless. I have not examined it.

ORDER XLVII. VACCINIACEÆ.

Small trees with alternate leaves, stipules none. Flowers in racemes, regular, bisexual. Calyx-tube ovoid, adnate to the ovary, segments 5. Corolla urceolate, 5-toothed. Stamens 10, free, anthers opening by apical pores often produced into two tubes. Ovary inferior, 5-celled with several ovules in each cell. Fruit a berry crowned with the calyx-limb, seeds few.

A small Order containing only 2 trees indigenous in Travancore. The berries of many species are edible, such as *V. Myrtillus* the "Whortleberry" and *V. oxycoccus* the "Cranberry" of Europe.

VACCINIUM, Linn.

Characters of the Order.

Leaves lanceolate over 3 in. Bracts persistent ... ...1. *V. nilgherrense*
Leaves ovate, less than 3 in. Bracts caducous ... ...2. *V. Leschenaultii*

1. **V. nilgherrense**, Wight, Fl. Br. Ind. iii 454; Bedd. Fl. Syl. CXXXVI; Gamble Man. Tim. 429; Brandis Ind. Tr. 407; Tam: *Kalávu.* 343

Leaves 3-4 in. by ¾-1 in. lanceolate, acute at both ends, glabrous, subsessile. Bracts leaf-like, persistent. Flowers ⅓ in. long, white, drooping, borne in axillary racemes 3-4 in. long. Berry globose, red, ⅓ in. diam.

A handsome little tree with beautiful flowers common at elevations between 2000-6000 ft. especially on the banks of streams. Height 20 ft. Diam. 8 in. Found also on the Neilgherries and hills of Southern India.

Flowers and fruits Feb.—March.

"Bark thin, dark greyish-brown. Wood reddish-brown, moder-"
"ately hard. Pores very small, very numerous. Medullary rays"
"moderately broad, wavy." (Gamble).

The fruit is eaten by the hill-people, but the wood is not used.

2. V. **Leschenaultii**, Wight; Fl. Br. Ind. iii 455; Bedd. Fl. Syl. t. 227 and CXXXVI (under *V. rotundifolium*); Trimen Fl. Cey. iii. 61; Gamble Man. Tim. 429; Brandis Ind. Tr. 407. Tam. *Kalávu.* 344

Leaves 1-2½ in. by ¾-1½ in. ovate, acute, finely serrate glabrous on both sides, coriaceous, young leaves pink. Bracts usually deciduous. petioles stout, ¼ in. Flowers ⅓ in. long. pink, in axillary and terminal racemes about 3 in. long. Berry globose, smooth. red, ⅓ in. diam., seeds pale brown.

A small tree common at the edges of scholas at the higher elevations 4000-7000 ft. Height 20 ft. Diam. 8 in. Occurs also in Ceylon and the hills of Southern India.

Flowers and fruits January-March.

"Bark thin, greyish-brown. Wood light reddish-brown, moder-" "ately hard. Pores small, rather scanty. Medullary rays broad," "shining, somewhat wavy."

W = 45 lbs.

"An ornamental little tree with pink flowers and a nice wood" "which might be useful for carving and turning, but requires to be" "well-seasoned or it will split. The fruit is edible and makes good" "tarts." (Gamble.)

The hillmen eat the fruit.

ORDER XLVIII. ERICACEÆ.

Trees or shrubs with alternate leaves, without stipules. Flowers regular, bisexual. Calyx not adnate to the ovary, segments 5. Corolla urceolate, lobes 5. Stamens 10, filaments free, anthers opening by terminal pores. Ovary superior, 5-celled with many ovules in each cell. Fruit a capsule with numerous seeds.

A small Order containing only one tree indigenous in Travancore, and a shrub with blue berries *Gaultheria fragrantissima* common on the High Range which yields an antiseptic oil from the leaves. It includes many beautiful cultivated plants of temperate climates belonging to the genera *Rhododendron, Azalea, Arbutus and Erica.*

RHODODENDRON, Linn.

Characters of the Order.

345 **R. arboreum**, Smith; Fl. Br. Ind. iii. 465; Bedd. Fl. Syl. t. 228 Trimen Fl. Cey. iii. 63; Gamble Man. Tim. 433; Brandis Ind. Tr. 409. Tam. *Alingi*. Mal. *Káttu Púvarasu.*

Leaves 3-5 in. by $1\frac{3}{4}$-$1\frac{1}{2}$ in., oblong-lanceolate, tapering to base, acute, glabrous above, densely covered beneath with a hard felt of hair, crowded at the ends of branches but below the flowers. Petiole $\frac{1}{3}$-$\frac{3}{4}$ in. Flowers $1\frac{1}{2}$-2 in. diam., dark crimson, sometimes pink, in short, terminal, capitulate racemes, each flower with a large, silky, caducous bract. Capsule $\frac{3}{4}$ in. oblong, hard and woody, valves at length reflexed.

A most beautiful tree of small size, common on grass lands at elevations of 5000 ft. and upwards abundant on the High Range. Height 25 ft. Diam. 1 ft. Occurs also on the hills of Southern India and Ceylon and on the Himalayas.

Flowers from December—April. Fruits March—June.

"Bark 1 in. thick, reddish-brown, peeling off in small flakes." "Wood soft, reddish-white, close-and even-grained, but apt to warp" "and shrink. Pores extremely small, uniformly distributed Rays" "a few moderately broad and short, separately by numerous fine" "ones. Annual rings marked by a belt of larger pores"

W=40 lbs.

"The wood is scarcely used except as fuel and of its value as" "firewood there are different opinions, some considering it not good" "others liking it much. It is apt to smoulder instead of burning" "with a flame. As charcoal it is not good." (Gamble). According to Beddome the wood is occasionally used for gunstocks, posts and other purposes, but in Travancore it does not seem to be used at all, as it grows at inaccessible elevations.

ORDER XLIX. MYRSINACEÆ.

Small trees and shrubs with alternate, simple leaves without stipules. Flowers regular, bisexual, occasionally polygamous. Calyx inferior (in Mæsa ½-adnate to the ovary) persistent, segments 5. Corolla-lobes 5, imbricate or contorted. Stamens 5 inserted on the corolla-tube opposite the lobes. Ovary superior or ½-inferior, 1-celled with few or many ovules, style simple. Fruit a berry or follicle. seeds solitary or many.

An Order of no importance to the Forest officer, though containing 8 small Travancore trees.

Fruit a berry; seed with endosperm.

- Berry enclosed in thickened calyx, many seeded ... 1. *Mæsa.*
- Berry free, calyx not thickened, seed solitary.
  - Corolla-lobes imbricate.
    - Flowers in axillary clusters ... ... 2. *Myrsine.*
    - Flowers in simple or compound racems ... 3. *Embelia*
  - Corolla-lobes twisted ... ... 4. *Ardisia.*

Fruit a follicle; seed without endosperm... ... 5. *Ægiceras.*

1. MÆSA, Forsk.

Small trees with flowers in compound racems. Calyx bibracteolate, tube adnate to the ovary, segments 5. Corolla campanulate, lobes short, much imbricate. Stamens 5. Ovary ½-inferior, style very short, ovules many. Berry globose, seeds with endosperm.

M. indica, A. DC.; Fl. Br. Ind. iii. 509; Bedd. Fl. Syl. cxxxvii; 346
Trimen Fl. Cey. iii. 67; Gamble Man Tim. 438; Brandis Ind. Tr. 414; Mal. *Kirithi.*

Leaves 2-6 in. by 1¼-2 in. ovate-lanceolate, tapering to base, acuminate, coarsely dentate, glabrous, pale green, nerves conspicuous. Petiole ½-1 in. Flowers white 1/10 in. long in panicles 2 in. long. Berry white ⅙ in. diam., seeds black.

A small tree or large shrub very common on waste land on the hills between 1000-5000 ft. Height 20 ft. Diam. 4 in. Occurs also through India, Ceylon and China.

Flowers and fruits throughout the year.

Gamble describes the timber as follows:—"Bark thin, reddish-" "brown with frequent reddish lenticels, somewhat horizontally" "arranged. Wood brownish-white, soft. Pores small, scanty and" "often in strings of 2-4. Medullary rays fine, numerous."

The values of W. and P. have not been ascertained. The leaves somewhat resemble those of the tea-plant, and it is therefore sometimes called "wild tea."

2. MYRSINE, Linn.

Small trees with flowers in axillary clusters, often polygamous Calyx-segments deep. Corolla-tube short, lobes acute, imbricate. Stamens 5. Ovary superior 1-celled, ovules few, style short, bifid. Berry globose, seeds solitary.

47 **M. capitellata**, Wall. ; Fl. Br. Ind. iii. 512 ; Bedd. Fl. Syl. t. 234 ; Trimen Fl. Cey. iii. 68 ; Gamble Man. Tim. 439 ; Brandis Ind. Tr. 415.

Leaves 3-6 in. by $\frac{3}{4}$-$1\frac{1}{4}$ in. oblong-lanceolate, tapering to base, obtuse, entire, glabrous, punctate, pale beneath. Petiole $\frac{1}{3}$-$\frac{1}{2}$ in. Flowers yellowish pink, $\frac{1}{4}$ in. across in small clusters in the axils of allen leaves. Berry $\frac{1}{3}$ in. shining and purple.

A small tree of the evergreen forests at elevations between 2000-60 0 ft. Height 20 ft. Diam. 4 in. Occurs on the hills of India' Ceylon, Burmah and Malaya.

Flowers January—April. Fruits in May—June.

Of the timber, Gamble says "Bark $\frac{1}{8}$ in. thick, grey, smooth," "Wood moderately hard, grey. Pores small, rather scanty, isolated" "or in short radial lines between the distant, broad, medullary rays" and he gives

W=48 lbs.

Beddome says that "the wood is hard and durable, and used" "for various purposes by the natives : the fruit is eaten."

3. EMBELIA, Burm.

Small trees with entire undulate glabrous leaves. Flowers very small, often polygamous. Calyx small, segments persistent. Corolla-lobes imbricate, deeply-cut. Ovary superior, 1-celled, with few ovules, style simple. Fruit a berry, seeds solitary.

348 **E. robusta.** Roxb. ; Fl. Br. Ind. iii. 515 ; Bedd. Fl. Syl. cxxxvii. Trimen Fl. Cey. iii. 70 ; Gamble Man. Tim. 440 ; Brandis Ind. Tr. 416.

Leaves 2-4 in. by 1-2 in. oval, rounded or acute at base, acuminate, glabrous, thin, paler beneath. Petiole $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers greenish-white, fragrant, small, in axillary and terminal panicles shorter than leaves. Berry $\frac{1}{6}$ in. diam., globose, red.

A small tree of the drier parts. Height 20 ft. Diam 4 in. Occurs also throughout India and in Ceylon and Burmah.

Flowers and fruits in June.

Gamble says "Bark $\frac{1}{4}$ in. thick, brown with horizontal cracks" "wood reddish. Pores small, often in groups or short radial lines." "Medullary rays extremely broad to broad, with yellow, apparently" "resinous, spots in them," and he gives

W=37 lbs.

No use is made of the tree in Travancore.

4. ARDISIA, Swartz.

Small trees with glabrous, pellucid-punctate leaves. Flowers bisexual in racemes or panicles, buds pointed. Calyx segments persistent. Corolla deeply cut, lobes twisted. Filaments short, anthers

sagittate. Ovary globose, 1 celled, ovules few, style simple. Fruit a berry with a solitary globose seed, endosperm ruminated.

Inflorescence terminal, paniculate.

Leaves oblong-lanceolate, panicle large ... ... 1. *A. missionis.*
Leaves oval, panicle small ... ... 2. *A. humilis.*

Inflorescence axillary, racemose.

Sepals and petals punctate ... ... 3. *A. pauciflora.*
Sepals and petals not punctate. ... ... 4. *A. rhomboidea*

1. **A. missionis,** Wall ; Fl. Br. Ind. iii. 519; Bedd. Fl. Syl. cxxxviii (under *A. paniculata*) ; Trimen Fl. Cey. iii. 71 ; Gamble Man. Tim. 441 (under *A. paniculata*) ; Brandis Ind. Tr. 419. 349

Leaves 5-12 in. by 3-5 in. oblong lanceolate, tapering to both ends, glabrous, entire or faintly crenate. Petiole short, thick. Flowers pale pink in large, drooping, terminal panicles, 6-8 in. long, with a few deciduous bracts at the base. Berry red ¼ in. diam.

A small tree of the evergreen forests widely distributed. Height 20 ft. Diam. 4 in. Occurs also on the Western Ghats, in Ceylon and Bengal.

Flowers January—April. Fruits May—August.

Gamble says that the "bark is thin, greyish brown. Wood pink-" "ish-white, moderately hard. Pores small, in radial lines. Medul-" "lary rays short, broad, wavy."

2. **A. humilis,** Vahl.; Fl. Br. Ind. iii. 529 ; Bedd. Fl. Syl. cxxxix. Trimen Fl. Cey. iii. 72 ; Gamble Man. Tim. 441; Brandis Ind. Tr. 418. 350

Leaves 4-9 in. by 2-4 in. oval or obovate, tapering to base, obtuse or acute, at apex, obscurely crenate, thick and glabrous. Petiole ¼ in. Flowers ½ in. across, bright pink, in terminal panicles 2-4 in. long, sepals brown. Berry over ½ in. diam., bright red.

A small tree, up to 25 ft. high and 6 in. diam. scattered through the evergreen forests at elevations from 0-4000 ft. Occurs also through India and in Ceylon and Malaya.

Flowers December-March. Fruits April-July.

Gamble describes the timber as follows; "Bark brown, "smooth. Wood grey, moderately hard. Pores small, in short" "radial lines. "Medullary rays, broad, dark, wavy" and he gives

W = 39 lbs.

3. **A. pauciflora,** Heyne., Fl. Br. Ind. iii. 529 ; Bedd. Fl. Syl. cxxxviii. Trimen Fl. Cey. iii. 75. Gamble Man. Tim. 441. Brandis Ind. Tr. 419. 351

Leaves 2-6 in. by 1-1½ in. lanceolate, tapering to both ends, entire but often undulate, glabrous. Petiole ¼ in. Flowers white, ⅓ in. across. 3-5 together in slender pedicels, arranged in axillary pedunculate racemes 1-2 in. long. Sepals and petals punctate. Berry red, ¼ in. diam.

A small tree common in the evergreen forests from 0-4000 ft. Height 25 ft. Diam. 6 in. Occurs elsewhere on the hills of S. India and in Ceylon.

Flowers December-March. Fruits April-June.

The timber has not been examined.

352 4. **A. rhomboidea,** Wight. Fl. Br. Ind. iii. 529; Bedd. Fl. Syl. cxxxviii; Brandis Ind. Tr. 419.

Leaves $1\frac{1}{2}$-3 in. by $\frac{1}{2}$-$\frac{3}{4}$ in. rhomboidal, acuminate, narrowed to the base, slightly crenulate, glabrous. Petiole very short. Flowers pinkish-white, small, in 3-5-flowered, short racemes. Sepals and petals not punctate. Berry $\frac{1}{4}$ in. diam.

A small tree common in the evergreen forests from 2000-4000 ft. Height 20 ft. Diam. 5 in. Found also on the Anamallays and the forests of Tinnevelly.

The wood is unknown.

5. ÆGICERAS, Gærtn.

Small trees with alternate, simple leaves and milky juice. Flowers in umbels. Calyx persistent, segments 5, twisted. Corolla-tube short, lobes 5, reflexed, twisted in bud. Stamens 5, inserted in the corolla-tube, anthers many-celled with transverse septa. Ovary superior, 1-celled, with many ovules. Fruit a follicle containing a single seed without endosperm.

353 **Æ. majus,** Gærtn.; Fl. Br. Ind. iii. 533; Bedd. Fl. Syl. cxxxix; Trimen Fl. Cey. iii. 74; Gamble Man. Tim. 442; Brandis Ind. Tr. 421.

Leaves 2-4 in. by 1-$1\frac{3}{4}$ in. obovate-oblong, tapering to base, rounded at apex, pale green and glabrous, very thick. Petiole $\frac{1}{3}$ in. Flowers white, fragrant, $\frac{1}{2}$ in. across, about 10 together in terminal, axillary or leaf-opposed umbels. Follicle $1\frac{1}{2}$-3 in. long, curved, very sharply pointed, bright brown, surrounded at the base by the persistent calyx.

A small tree from 10-20 ft. high very common on the canals and backwaters of the low country. Found throughout India, Ceylon and the Andamans.

Flowers and fruits in January-February and again in July.

Gamble says of the timber "Bark grey, $\frac{1}{4}$ in. thick. Wood" "reddish-brown, often streaked with yellow, moderately hard, even-" "grained. Pores very small, scanty. Medullary rays moderately" "broad to broad, short, scanty," and he gives

W = 39 lbs.

The wood is used for fuel and hut-building.

ORDER L. SAPOTACEÆ.

Trees with alternate, entire leaves and a milky juice, stipules none, or small and quickly caducous. Flowers regular, bisexual, axillary. Calyx-segments 4-8, persistent, much imbricated, or biseriate with the outer series valvate. Corolla-lobes as many, or 2-4 times as many, as calyx-segments, imbricate or twisted, or in 2-3 series,

Stamens inserted at the base of or on the corolla-tube, 5, 6, 8 or 12, one or two opposite each lobe, anthers long, connective often produced, staminodes when present alternating with the stamens. Ovary superior, 4-8 celled with 1 ovule in each cell, style simple. Fruit a berry with 1-8 shining seeds, with or without endosperm.

An important Order containing several trees which produce guttapercha or edible flowers or fruits. Most of them yield valuable timbers. Of indigenous trees Travancore contains 10. To this Order belong *Achras Sapota* the "Sapodilla" from the West Indies, yielding an edible fruit and a fancy wood for furniture, *Argania sideroxylon* the "Argan" tree of Mexico, producing a valuable oil from its seeds, *Bassia latifolia* the "Mohwa" tree of Central India, whose flowers are dried and eaten, or used for distilling a spirit, and *Palaquium Gutta* the "Gutta-percha" tree of the Malay peninsula.

Calyx-segments 5 in one series, imbricate. Stamens 5.
  Staminodes absent . . . 1. *Chrysophyllum*.
  Staminodes present . . . 2. *Sideroxylon*.
Calyx-segments 4, 6 or 8 in two series, outer valvate.
  Stamens 6-24.
    Calyx-segments 4.
      Corolla-lobes 4. Stamens 8 . . . 3. *Isonandra*.
      Corolla-lobes 6-12. Stamens 12-24 . . . 4. *Bassia*.
    Calyx-segments 6 or 8
      Corolla-lobes 6. Stamens 12 or 18.
        Staminodes 0 . . . 5. *Palaquium*.
      Corolla-lobes 18-24. Stamens 6 or 8.
        Staminodes 6 or 8 . . . 6. *Mimusops*.

I. CHRYSOPHYLLUM, Linn.

Trees with small flowers in axillary clusters. Calyx-segments 5 in one series, much imbricated. Corolla-lobes 5, imbricate. Stamens 5, inserted at base of corolla, staminodes none. Ovary 5-celled. Berry fleshy, globose, containing 5 large seeds, with endosperm.

C. Roxburghii, G. Don; Fl. Br. Ind. iii. 535; Bedd. Fl. Syl. t. 236; Trimen Fl. Cey. iii. 76, Gamble Man. Tim. 443, Brandis Ind. Tr. 423. Tam: *Kappálei* Mal: *Atha*. 354

Leaves 2-6 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. oblong-lanceolate, acuminate, very glabrous, with very numerous, parallel, secondary nerves joined at the edge of the leaf. Petiole $\frac{3}{4}$ in. Flowers greenish-white, ·$\frac{1}{8}$ in. long, 10 or 15 clustered together. Berry globose, yellowish-green, $1\frac{1}{2}$-2 in diam. resembling an apple and containing 5 very shining, brown seeds, $\frac{3}{4}$ in. long arranged in a circle.

A lofty evergree tree very abundant in the Travancore forests between 0-4000 ft. Height 90 ft. Diam. 2 ft. Found also in Southern India, Ceylon, Assam and Burmah.

Flowers in Feb.–March. Fruits November-February.

Bark dark grey, smooth. Wood greyish-white, moderately hard, dull, coarse-grained, splitting easily. Pores medium sized and small in short radial lines, few. Rays very fine numerous and equidistant. Annual rings marked by indistinct dark lines.

W = 36 lbs. P = 476.

The wood of this tree is sometimes used for shingles, but it is not to be recommended, as it is bored by beetles and soon decays. The fruit is said to be edible, but it is so full of sticky, white juice that I cannot imagine any one eating it.

2. SIDEROXYLON, Linn.

Trees with twigs often spinous, and flowers in axillary clusters. Calyx-segments 5 in one series, much imbricated. Corolla-lobes 5, imbricate. Stamens 5, attached to the base of the corolla alternating with lanceolate staminodes. Ovary 5-celled, style very long. Berry globose. seed small, solitary with endosperm.

355 **S. tomentosum**, Roxb ; Fl. Br. Ind. iii. 538, Bedd Fl. Syl. t. 235 (under *Achras elengioides*), Trimen Fl. Cey. iii. 77. Gamble, Man. Tim. 444. Brandis Ind. Tr. 422.

Leaves 1½-4 in. by ¾-2 in. obovate-oval, tapering to the base, subacute, glabrous when mature, young parts rusty-pubescent. Petiole 1/5 in. Flowers white, ¼ in. long in rounded axillary clusters. Ovary very hairy. Berry ¾-1 in., ovoid, pubescent when young, at length glabrous, green, seed ½ in. long, brown, shining.

A much-branched tree of moderate size, not seen by me but probably to be found in the evergreen hill-forests. Occurs also in S. India, Ceylon and Burmah

" Gamble says that the bark is light reddish-brown, thin much cracked. Wood light yellowish-brown, moderately hard to hard. Pores fine to moderate-sized in groups in short lines, usually oblique. Medullary rays very fine, very numerous, equidistant, crossed by numerous faint, irregular lines, and he gives."

W = 56 lbs.

" Beddome says that the wood makes good beams for houses and good carpenters' planes. The fruit is eaten in curries and made into pickles.

3. ISONANDRA, Wight.

Trees with strongly-veined leaves and small flowers, sessile in axillary fascicles. Calyx-segments and corolla-lobes 4 each, all imbricate. Stamens 8, inserted on the corolla-tube. Ovary 4-celled. Berry ovoid-oblong, pointed, containing a solitary seed with endosperm.

356 ***I. lanceolata**, Wight, Fl. Br. Ind. iii. 539, Bedd. Fl. Syl. cxli (under *Bassia Wightiana*); Trimen Fl. Cey. iii.; 77; Gamble Man. Tim. 444; Brandis Ind. Tr. 424.

Leaves 1-3 in. by ½-1 in. oblong-oval, tapering to base, acuminate or rounded, glabrous, paler beneath, with 6-8 pair secondary nerves. Petiole ¼ in. Flowers 1/12 in. across, white, fragrant, in dense clusters in the axils of present or fallen leaves. Berry ¾ in. scarlet, cylindrical containing one shining brown seed.

* Under this name Sir D. Brandis includes *I. villosa*, *I. Wightiana*, *I. Candolleana*, and *I. Perrottetiana*

A rather small tree not uncommon in evergreen forests at 3000-5000 ft. Height 30 ft. Diam. 1 ft. Occurs also in S. India and Ceylon.

Flowers March-April. Fruits June-July.

Trimen describes the wood as hard and heavy. Gamble says of *I. Candolleana* that it is a useful timber. "Bark brown. Wood", "light reddish-brown, hard, close-grained, Pores moderate sized" "in straight radial strings of 4 or 5. Annual rings marked by a" "dark line without pores. Medullary rays fine, regular" and he gives.

W = 48 lbs.

Not used in Travancore.

4. BASSIA, Linn.

Trees with usually caducous stipules and flowers in fascicles in the axlis of present or fallen leaves. Calyx deeply divided into two pairs of segments, persistent. Corolla tube campanulate, lobes 6-12 twisted. Stamens 2 or 3 times as many as corolla-lobes, anthers acute, usually mucronate. Ovary 6-8-celled, style long. Fruit ovoid containg 1-5 seeds without endosperm.

Mature leaves glabrous beneath. Seeds solitary (or 2)
 Leaf-nerves 12 pair. Ovary hairy . 1. *B. langifolia.*
 Leaf-nerves 15-25 pair. Ovary glabrous . 2 *B. malabarica.*
Mature leaves hairy on mid rib beneath. Seeds 4-5. 3. *B. f lva.*

1. **B. longifolia**, Fl. Br. Ind. iii. 544; Bedd. Fl. Syl. t. 42; 357
Trimen Fl. Cey. iii. 79; Gamble Man. Tim. 448. Brandis Ind. Tr. 427. Tam. *Illuppei.*

Leaves $3\frac{1}{2}$-5 in. by $1\frac{1}{2}$-2 in. lanceolate, tapering to both ends, glabrous when mature, venation pellucid, nerves 12 on each side, crowded at ends of branches, stipules linear. Petiole slender $\frac{1}{2}$-$1\frac{1}{2}$ in. Flowers $\frac{2}{3}$ in. long, pale yellow, solitary on 2 in. pedicels in the axils of small bracts. Ovary hairy. Fruit 2 in. long, obliquely-ovoid containing 1 (rarely 2) compressed shining, ochre-yellow seeds.

A large, umbrageous tree probably not indigenous in Travancore, but much planted in the drier parts of the country, as Shencottah and Nagercoil, and run wild. Huge specimens evidently, of great age, are seen about Puliyara. Height 80 ft. Diam. 3 ft. Occurs also in the drier parts of Malabar and Ceylon.

Flowers February-May. Fruit ripens September-October.

Of the timber Gamble seys "Bank dark yellowish-grey, thick" "slightly furrowed. Wood red, moderately hard, close-grained." "Pores small to moderate-sized, in short radial or oblique echeloned" "strings. Medullary rays numerous, fine uniform, equidistant," "bent round the pores. Transverse bars fine irregular, wavy," and he gives.

W = 61 lbs. P = 727,

In Travancore the tree is grown for the oil contained in the seeds, which is used for burning. Its timber is valued. Elsewhere. the flowers are eaten and used for the distillation of spirit. Beddome says that the wood is "heavy, close and straight grained, very" "flexible and durable. valued for ships' keels and for planking" "below the waterline, makes good trenails, and is used in the construction of carts and for bridges.

358 2. **B. Malabarica**, Bedd: Fl. Br. Ind. iii. 544; Bedd. Fl. Syl. cxl; Gamble Man. Tim. 448; Brandis Ind. Tr. 427. Mal. *Atta iluppa*.

Leaves 3-10 in. by 1-2½ in. lanceolate or oblong, tapering to base, acute or obtuse at apex, very coriaceous, glabrous and shining, with 15-25 nerves on each side. Petiole ¼-¾ in. Flowers yellowish-white, ½ in. across. 4-10 together on 1 in. axillary peduncles at the ends of the branches. Ovary glabrous. Fruit 1 in. long by ⅓ in. seed brown, solitary.

A small tree common on the sides of rivers in the low country throughout Travancore. Height 30 ft. Diam. 1 ft. Occurs also in S. Canara, Malabar and the Anamallays up to 4000 ft.

Flowers Dec.-Jan. Fruits April to May.

Bark dark brown and knotty. ⅓ in. thick. Sapwood pale, heart darker. Wood dull brownish-red with patches of darker colour, smooth, mottled, often shining, hard. Pores numerous of medium size, in strings of 6 or 8. Rays fine and numerous, crossed by thin transverse bars of darker tissue.

W=51 lbs. P=471.

Neither the wood nor the fruit seem to be used.

359 3. **B. fulva**, Bedd: Fl. Br. Ind. iii. 545: Bedd. Fl. Syl. cxl; Trimen Fl. Cey. iii. 81: Gamble Man. Tim. 449 (No. W. 4730) Mal. *Thandidiyan*.

Leaves 9-12 in. by 2½-3 in. obovate-oblong, retuse or with a sudden point, tapering to the base, glabrous above when mature, and fulvous hairy on the veins beneath, venation prominent beneath, 18-22 pairs. Petiole densely woolly ¼-¾ in. Flowers ⅔ in. long. yellowish-white on 1-1½ in. peduncles, very numerous at the ends of the branches when the tree is leafless. Stamens about 24. Berry green, smooth, ovoid 1½ in.

A rare tree of medium size occurring in the Ariankavu and Shendurni valleys, but not seen elsewhere, I have only once obtained it in flower and fruit. Height 70 ft. Diam. 1½ ft. Found also in Ceylon.

Flowers October to November. Fruits in March.

Bark greyish-brown, deeply cracked, ⅓ in. thick. Wood pinkish-brown, moderately hard, fibre long and straight. Pores medium-sized to large, in radial strings of 2-4. Rays fine, regular and prominent. Transvesre bars prominent and regular.

W=53 lbs. P=855.

Evidently a good wood, even and strong, but not used.

5. PALAQUIM, Blanco.

Trees with glabrous leave, and flowers solitary or in axillary fascicles. Calyx-segments 6, deeply cut, in 2 series, the outer valvate, the inner imbricate. Corolla-lobes 6, imbricate. Stamens 12-18 inserted in one row on the corolla-tube, staminodes none. Ovary 6-celled, style long. Fruit ovoid, fleshy, containing a solitary seed, without endosperm.

Leaves dark green, ovate, petiole 1 in. Flowers glabrous . 1. *P. ellipticum.*

Leaves pale green, lanceolate, petiole $\frac{1}{4}$ in. Flowers rusty-tomentose . 2. *P Bourdilloni.*

1. **P. ellipticum**, Benth; Fl. Br Ind. iii. 542 (under *Dichopsis ellipticum*); Bedd. Fl. Syl. t. 43 (under *Bassia ellipticum*). Gamble Man. Tim. 446, Brandis Ind. Tr. 424 Tam. *Kátt illupei*. Mal. *Pála, ehoppála, páchenthi*. 360

Leaves 3-4 in. by $1\frac{1}{2}$-2 in. ovate or obovate, terminating in a blunt point, obtuse, glabrous, dark green above, paler beneath, bronzed when young. Petiole 1 in. Flowers $\frac{1}{2}$ in long and across, white, fragrant, on 1 in peduncles, 1-4 together in the axils of present or fallen leaves. Fruit $1\frac{1}{2}$ in. by $\frac{2}{3}$ in. ellipsoid, smooth, green.

A very lofty tree of the evergreen forests between 1000-4000 ft., with a straight, unbranched, cylindrical stem. Height 100 ft. Diam. $3\frac{1}{2}$. Occurs all down the Western Ghauts from Bombay southwards, absent from Ceylon.

Flowers Dec.-April. Fruits May—August.

Bark brown mottled with white, $\frac{3}{4}$ in. thick. Sapwood white, 2 in. thick, heart-wood reddish-brown, straight-grained, even, moderately hard and durable. Pores medium-sized to large arranged in short, wavy, radial lines. Rays fine, numerous, crossed by frequent concentric bands of light tissue. Annual rings indistinct, but marked by darker lines.

W=44 lbs. (when very dry 35 lbs.) P=472.

This trees is more commonly used by planters for shingles than any other. The wood is straight-grained and splits easily, and if the shingles are carefully selected, rejecting the white outer wood they will last for 12 or 15 years. The wood is also used for buildings, planking and rafters but it is not very strong. It may be classed with ven-teak. The thick milky juice has been collected and tried as gutta-percha, but it is too resinous to be really valuable

2. **P. Bourdilloni**. Brandis, Brandis. For Tr. 424. 361

Leaved 5-8 in. by $1\frac{1}{2}$-3 in. lanceolate or oblong-lanceolate, narrowed to the base, terminating in a sudden blunt acumination: glabrous, pale green. very coriaceous, Petiole $\frac{1}{3}$ in. Flowers $\frac{1}{4}$ in across in axillary, few-flowered, rusty fascicles, pedicels $\frac{1}{2}$ in, corolla-tube short. Fruit unknown.

A medium-sized tree found by me in the evergreen forests of the Kulathupuzha valley on the Strathmore Estate. Height 40 ft. Diam. 1 ft. Endemic.

Flowers in April.

The timber is unknown.

6. MIMUSOPS, Linn.

Large trees with coriaceous leaves having many parallel nerves. Flowers solitory or in axillary fascicles. Calyx-segments 6 or 8 in two series, outer valvate. Corolla-tube short, lobes 18-24 in two rows, lobes of the outer row often divided. Stamens 6 or 8 inserted at the base of the corolla-tube, alternating with 6 or 8 staminodes, anthers lanceolate. Ovary 6 or 8-celled, hairy, style exserted. Fruit a berry containing 1-6 seeds in fleshy endosperm.

Leaves short, acuminate. Calyx-segments and stamens 8, staminodes hairy . 1. *M. Elengi*.

Leaves obtuse. Calyx-segments and stamens 6, staminodes glabrous . 2. *M. Roxburghiana*.

362 **1. M. Elengi**, Linn.; Fl. Br. Ind. iii. 548; Bedd. Fl. Syl. t. 40; Trimen Fl. Cey. iii. 86; Gamble Man. Tim. 449; Brandis Ind. Tr. 425. Tam. *mahila*, *magadam*, Mal. *Elenji*.

Leaves 3-5 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in. ovate, shortly acuminate, base more or less rounded, glabrous on both surfaces, dark green and shining above, paler beneath, lateral nerves very numerous, stipules lanceolate, caducous. Petiole 1 in. Flowers white $\frac{1}{2}$ in. across, very fragrant in fascicles of 1 to 5 in leaf-axils, pedicels $\frac{1}{4}$-$\frac{3}{4}$ in. pubescent. Calyx-segments 8, corolla-lobes 16-24 in 2 rows. Stamens 9 staminodes oval, hairy. Berry 1 in ovoid, apiculate, glabrous, orange-yellow, seed solitary (or 2) brown, shining.

A handsome evergreen tree, rare, only seen by me in the forests near Ariyankavu but largely planted all about the low country for its ornamental appearance and fragrant flowers. Height 60 ft. Diam. $2\frac{1}{2}$ ft. Occurs wild in Central India, Ceylon and Malaya.

Flowers in March-April. Fruits Aug-Sep.

Of the wood Gamble says "Bark dark grey, rough, deeply cracked" " with vertical and transverse fissures. Wood very hard, close-and" " even-grained : sapwood reddish-brown : heartwood dark red. Pores" " small in short lines, which are generally radial, but often irregu-" " lar and oblique. Medullary rays very fine, very numerous, uni-" " form and equidistant. Many parallel, wavy, concentric bands," " narrow but conspicuous, and he gives."

W = 60 lbs. P = 632.

Trimen describes the wood as looking like raw beef when freshly cut, afterwards pale reddish-brown, and in a recent number of the Indian Forester (Forest Bulletin No. 6 of 1906) Prof. Everett's experiments show that it is one of the strongest woods known, the value of P being found b him to be 1291.

The wood is strong, durable and heavy. It is used for house building, carts and for rice-pounders. It is an excellent fuel. The bark is used for dyeing, and both it and the unripe fruit are employed in native medicine for their astringent properties. The fruit is sometimes eaten, and an oil for cooking and lighting is expressed from the seeds. The flowers are much used for making garlands. They contain a sweet-scented, volatile oil. (Dict. Ecnom. Prod of India).

2. **M. Roxburghiana**, Wight; Fl. Br. Ind. iii. 548. Bedd. Fl Syl. cxlii; Gamble Man. Tim. 449, Brandis Ind. Tr. 425. Tam. *Kánapálei*. 363

Leaves 2½-3 in. by 1½-2 in. oval-oblong, obtuse at both ends, coriaceous, glabrous. Petiole ½-¾ in Flowers white, 2-4 together on 1 in. pedicels; calyx-segments, stamens and staminodes 6; corollalobes 12-18 in. 2 rows. Fruit globose, ¾ in. long, 3-6 seeded.

A large tree of the evergreen forests on the Cardamom Hills. Height. 60 ft. Diam. 2 ft. Occurs also on the Anamallay and other hills of the Western Ghats.

Beddome says that the "wood is reddish-brown, rather coarse-" "grained, but strong, durable and easily worked; and that it is" "used for house-building and gun-stocks" and he gives.

W = 60 – 64 lbs.

Not used in Travancore.

ORDER LI. EBENACEÆ.

Trees with alternate (rarely sub-opposite) entire, exstipulate leaves. Flowers regular, unisexual, usually diœcious, (sometimes monœcious or polygamous) axillary or from the old wood. Caylx free, often enlarged in fruit. segments 3-5 (rarely 6-7). Corolla tubular, often hairy without, lobes equalling calyx-segments, contorted. Stamens in the male flowers 4-64 inserted at the base of the corolla, often unequal and in pairs or otherwise connate, anthers lanceolate, connective often produced. Staminodes in the female flowers 0-16. Ovary superior, 3-10-celled with 1 or 2 ovules in each cell. Styles 1-5. Fruit indehiscent, fleshy or hard. Seeds 2-10, large with copious endosperm, often ruminate.

A large Order containing 20 trees indigenous in Travancore. To it belong the different species of Ebony and several other trees yielding a mottled or streaked, ornamental wood. Two foreign species of *Diospyros* yield an edible fruit. D. *Kaki* the "Chinese Date Plum" which is dried in the sun and made into sweet meats, and D. *Virginiana* "the Virginian Date Plum" or "Persimmon." It is possible that the fruit of some of our species might be used in the same way

Flowers 3—merous. Ovary 3—(or 6) celled .. 1. *Maba*.
Flowers 4— —merous. Ovary 4-10—celled 2. *Diospyros*.

I. MABA. Forest.

Trees with reticulate leaves and diœcious flowers, solitary or few together. Calyx small, sometimes enlarged in fruit, segments 3, short. Corolla-tube cylindrical, lobes 3, contorted. Stamens 3 16. inserted at the base of the corolla, often unequal. Ovary 3-celled with 2 ovules in each cell, stigma 3 lobed. Fruit dry 1-6 seeded. endosperm equable.

M buxifolia, Pers: Fl. Br. Ind. iii. 551: Bedd. Fl Syl. cxlviii; Trimen Fl. Cey. iii. 89; Gamble Man. Tim. 452; Brandis Ind. Tr. 437; Tam. *Irumpálei*. 364

Leaves ¼—1 in. by ⅓—⅔ in. or larger, very variable, obovate-oblong, tapering to base, very obtuse, revolute, coriaceous, glabrous

finely reticulate. Petiole $\frac{1}{8}$ in. Flowers pinkish-white, 1-3 together, calyx cuplike, enlarged in fruit, corolla campanulate, very hairy outside. Stamens 6-12. Fruit $\frac{3}{8}$ in. ovoid, apiculate, glabrous, red, containing 1-3 yellow seeds.

A small tree or large bush found in the drier evergreen forests from 0-2000 ft. in. S. Travancore and near Arienkavu. Height 40 ft. Diam. 1 ft. Occurs also through S. India, in Ceylon, the Malay Peninsula and Africa.

Flowers Feb.-May. Fruits July-Sep.

Bark greyish-black, thin. Wood greyish-brown with black streaks, close-grained but liable to split, hard. Pores small to medium-sized, running in irregular radial lines. Rays very fine and numerous. Transverse pale wavy bands numerous.

W=49 lbs. P=977.

Trimen says that the "Wood is hard and durable. Fruit rathe pulpy when ripe, edible" Wood not used in Travancore.

2. DIOSPYROS, Linn.

Trees with dark green leaves and usually black bark. Flowers diœcious (sometimes monœcious or polygamous) axillary or from the old wood. Calyx often enlarged in fruit, segments 4 or 5. Corolls tubular. Stamens in male flowers 4-64. connate or free. Staminode in female flowers 0-16. Ovary 4-10 celled with 1 ovule in each cell Fruit fleshy or hard.

Female flowers solitary or in pairs.
Calyx of male and female similar. Stamens usually in pairs.
Corolla of male hairy. Leaves hairy ... 1. *D. pruriens.*
Corolla of male hairy or tomentose. Leaves glabrous.
Male flowers in short cymes, Calyx not enlarged in fruit.
Fruit under 1in. dry. Endosperm equable ... 2. *D. oocarpa.*
Fruit 1 in. pulpy. Endosperm equable ... 3. *D. nilagirica.*
Fruits over $1\frac{1}{2}$ in. woody. Endosperm ruminate ... 4. *D. insignis.*
Male flowers in pedunculate panicles. Calyx foliaceous enlarged ... 5 *D. paniculata.*
Corolla of male with lines of hairs along midribs of lobes, otherwise glabrous ... 6. *D. microphylla.*
Corolla of male glabrous or slightly pubescent, leaves glabrous or pubescent.
Caylx-segments foliaceous, enlarged in fruit.
Leaves under 3 in. Endosperm equable ... 7. *D. montana.*
Leaves over 3 in. Endosperm ruminate .. 8. *D. sylvatica.*
Calyx-segments not enlarged in fruit.
Leaves under 3 in. Stamens 16-20 ... 9. *D. orixensis.*
Leaves over 3 in. stamens 24-32 ...10. *D. Toposia.*
Calyx of male and female dissimilar.
Corolla of male tomentose. Endosperm ruminate. 11. *D. affinis.*
Corolla of male glabrous. Endosperm equable.
Coralla of male tubular. Stamens very unequal,
Calyx glabrous, segments shallow. Stamens 16 24...12, *D. ebenum.*

Calyx pubescent, segments deep. stamens 24-32 ... 13. *D. assimilis.*

Corolla of male campanulate. Stamens equal.

Leaves over 5 in. Stamens 24-64. Ovary 8-celled ...14. *D. embryopteris*

Leaves under 5 in. Stamens 12-16. Ovary 4-celled ...15. *D. foliolosa.*

Female flowers in short 2-10 flowered cymes in the axils of fallen leaves.

Corolla of male flowers tomentose. Stamens 10 ... 16. *D. candolleana*

Corolla of male flowers glabrous. Stamens 14-20... 17. *D. ovalifolia.*

Female flowers in compound cymes on the old wood ... 18. *D. bourdilloni.*

Flowers not sufficiently known for classification ... 19. *D. sulcata.*

1. D. **pruriens**, Dalz; Fl. Br. Ind. iii. 553; Bedd. Fl. Syl. cxliv; Trimen Fl. Cey. iii. 95; Gamble Man. Tim. 454; Brandis Ind. Tr. 429. **365**

Leaves 2-4 in, by $\frac{3}{4}$-$1\frac{1}{2}$ in. oblong-lanceolate, base rounded bluntly acuminate, covered with long stiff hairs beneath, glabrous above except along the midrib. Petiole $\frac{1}{6}$ in. very hairy. Flowers 4-merous. male flowers $\frac{3}{4}$ in. long, yellowish-white, in 1-4 flowered cymes, stamens 12-14; female flowers solitary, similar to male, staminodes 5. Fruit 4 celled, 1 in. long ovoid-conical, covered with yellow stinging hairs, fruiting calyx slightly enlarged, endosperm equable.

A small tree probably to be found in our evergreen forests as it occurs in Tinnevelly, though I have not seen it. Found also in the forests of the Western Ghauts from Bombay southwards and in Ceylon.

Wright says that the timber is white tinged with yellow, turning red with exposure, heavy and compact. (Ann. Perad. Gard. ii. 153). The wood is not used.

2. D. **nilagirica**, Bedd; Fl. Br. Ind. iii. 566; Bedd. Fl. Syl. cxliv; Gamble Man. Tim. 462; Brandis Ind. Tr. 428; Tam. *Karu.* **366**

Leaves 3-6 in. by 1-2 in. oblong-lanceolate, narrowed to both ends, densely rufotomentose beneath when young, above dark green, coriaceous, Petiole $\frac{1}{2}$ in. Flowers yellowish white, 4-merous: male flowers $\frac{1}{2}$ in long in fascicles of 3-6, corolla hairy without, stamens 16, female flowers solitary; staminodes 8. Fruit 1 in. globose, green; glabrous, 8-celled, calyx not enlarged, endosperm equable.

A medium sized tree, common in the evergreen forests at 3000-4000 ft. on Peermade and the Cardamom Hills. Height 60 ft. Diam. $1\frac{1}{2}$ ft. Occurs also on the Neilgherries and Western Ghauts, but not in Ceylon.

Flowers March-April. Fruits June-December.

Bark black, $\frac{1}{2}$ in. thick. Wood brownish-yellow, straight and close-grained, moderately hard. No black heart wood; Pores medium-sized, scanty, in wavy, radial lines. Rays very fine and very numerous, crossed by prominent transverse bars.

W=44 lbs. P=605.

The wood is not used.

3. D. **oocarpa**, Thw. Fl. Br. Ind. iii, 560: Trimen Fl. Cey. iii. 97; Gamble Man. Tim. 459; Brandis Ind. Tr. 428 Tam. *Vellei karunkáli.* **367**

Leaves 2-4 in. by 1-1¾ in. ovate, obtusely acuminate, tapering to the petiole, glabrous and shining, coriaceous. Petiole ⅓ in. flat. Flowers 4-merous (or 3) yellowish white ½ in. long : male in 3 -7 flowered cymes, stamens 9-14, unequal : female 1 or 2 together, rather larger than male, staminodes 3. Fruit 4-8-celled, 1 in. long, ovoid-cylindric, hard, calyx slightly enlarged, flat, circular, seeds brown, endesperm equable

A small tree found by me in the evergreen forests near Arienkavu at 1,000 ft. rare Height 30 ft. Diam. 1 ft. Found also in the forests of Kanara and in Ceylon.

Flowers March—April. Fruits July—August.

" Bark yellowish. Wood greyish-brown with irregular purplish-" " black heartwood with paler streaks, moderately hard. Pores " " moderate sized to large, very scanty. Rays very fine and numerous" (Gamble)

W=45 lbs.

Wright says that the timber is very variable. The heartwood of large trees is irregular in outline and presents a beautiful alternation of black and brown layers. Such specimens are almost equal to "Calamander" wood for ornamental purposes. The sapwood of large trees often possess irregular dark lines which in longitudinal section give good patterns. (Ann. Perad. Gard. ii. 163).

368 4. D. **insignis**. Thw ; Fl. Br. Ind. iii. 565 ; Bedd Fl. Syl. cxlv. Trimen Fl. Cey. iii. 100. Gamble Man. Tim. 460, Brandis Ind. Tr; 428.

Leaves 4-14 in. by 2-6 in. often sub-opposite, lanceolate-oblong, accuminate, glabrous, dark green above, paler beneath. Venation conspicuous and reticulate. Petole ⅓ in. stout. Flowers yellowish-white 4-merous ½ in. long, male in crowded clusters, calyx pubescent stamens 14-20, very unequal, female 1-3 together, sessile, staminodes 5, ovary 8-celled. Fruit 1½ in. depressed globose, smooth, woody, calyx enlarged forming a shallow, square, wooden cup, endosperm ruminate.

A lofty tree of the evergreen forests of N. Travancore at low elevations, seen by me on the Periyar. Height 80 ft. Diam. 2 ft. Occurs also on the Anamallayas and in Ceylon.

Flowers in March and September (Ceylon)

Trimen says that the heartwood is small and black with pale streaks, but Wright states that the timber is " white when freshly cut," " turning a dirty colour with exposure. Only on one occasion was the" " black heartwood present and this was very small and rotten". (Ann Pera. Gard. ii. 184.)

369 5. D. **paniculata**, Dalz ; Fl. Br. Ind. iii. 570. Bedd Fl. Syl. cxliv, Gamble Man. Tim. 463, Brandis Ind. Tr. 429. Tam. *Karun thuvarei*. Mal. *Kari: karivella. illakatla.*

Leaves 3-8 in. by 1-2½ in. oblong-lanceolate, obtusely acuminate, closely recticulate, glabrous, thin and bright yellow when young, at length dark green and coriaceous. Petiole ¼-⅓ in. Flowers greenish-white, ⅓ in. long, 5-merous, male in few-flowered, axillary, pedunculate cymes, stamens 16-20 in pairs, equal, female solitary, staminodes

10, bracts in both large, foliaceous, ovate. Fruit ovoid 1 in. long, green, densely tomentose, 4-celled, calyx foliaceous, accrescent, endosperm equable.

A very handsome tree of medium size, common in the evergreen forests of the low country and on the hill-slopes up to 3,000 ft. Height 50 ft. Diam. $1\frac{1}{4}$ ft. Occurs also on the Western Ghauts and the Anamalays, but absent from Ceylon.

Flowers Jan.—March. Fruits June—July.

Bark black rather rough $\frac{1}{3}$ in. thick. No black heart. Wood soft white and grey in irregular patches with occasional narrow stripes of black. Pores very scanty, medium-sized or large, running in oblique radial lines. Rays very fine, closely packed, wavy and prominent.

W=46 lbs. P=445.

The wood is not used.

The Hillmen distinguish two trees, which I cannot separate, called respectively *Karivella add Illakatta.* The leaves of the last are used for poisoning fish, but not those of the first.

6. **D. microphylla.** Bedd. Fl. Br. Ind. iii. 559, Bedd. Fl. Syl. cxlv, Gamble Man. Tim. 458. Brandis Ind. Tr. 431. Tam. *Chinnathuvarei. molaghu thuvarei.* Mal. *Thovara kâri. kâtta thovara.* 370

Young branches covered with long yellow hairs, leaves $\frac{1}{2}$-$1\frac{1}{4}$ in. by $\frac{1}{4}$-$\frac{2}{3}$ in. ovate-oblong, cuneate at both ends, glabrous except the mid rib, and very dark green above, covered with long yellow hairs on both sides when young. Petiole. 1/10 in. Flowers white, 4-merous. male $\frac{1}{8}$ in., 1-3 together in small axillary cymes, stamens 16 in pairs, unequal. female $\frac{1}{3}$ in. solitary, ovary 4-celled. Fruit ovoid, glabrous, purple, $\frac{3}{4}$ in by $\frac{1}{2}$ in. containing 1 seed (rarely 2), calyx not accrescent, endosperm equable.

A very lofty tree with a black. cylindrical stem, flecked with white, common in all the evergreen forests of Travancore from sea level to 2000 ft. Height 100 ft. Diam. $2\frac{1}{2}$ ft. Found also on the Western Ghauts. Anamallays and the Malay Peninsula but absent from Ceylon.

Flowers Jan—March. Fruit ripens June—July.

Bark $\frac{1}{8}$ in. thick, rough, black covered with white and green lichens. No black heart wood reddish-grey, hard, close-grained and even. Pores large, scanty, often divided, in radial lines of 4 to 10. Rays very fine, numerous, crossed by faint, darker lines, close and frequent.

W=49 lbs. P=613.

Young trees make excellent walking sticks, as they are very straight. The wood is not used. The tree itself is well worth cultivating for its ornamental appearance.

7. **D. montana,** Roxb. Fl. Br. Ind. iii. 555, Bedd, Fl. Syl. cxliii, Trimen Fl. Cey. iii. 92. Gamble Man. Tim. 454. Brandis Ind. Tr. 431. Tam. *Vellei thuvarei, vakkani.*

Leaves 1-3 in. by $\frac{1}{2}$-$1\frac{1}{2}$ in. linear or ovate-oblong, acuminate, base rounded, finely pubescent when young, at length glabrous. Petiole $\frac{1}{4}$-$\frac{1}{2}$ in. pubescent. Flowers white, 4-merous, $\frac{1}{3}$ in. long, male 2-6 together in axillary, pedunculate cymes, stamens 16, usually in pairs female solitary, on short peduncles, staminodes 4, ovary 8-celled, glabrous. Fruit $\frac{3}{4}$ in. globose-apiculate, glabrous and shining reddish-yellow deepening to brown, calyx foliaceous, slightly enlarged, segments reflexed. Seeds 3-6, rough, black, $\frac{3}{8}$ in. long, endosperm equable.

A medium-sized or large tree of the drier evergreen forests, often spinous, common in Travancore, where the rainfall is less than 100 inches, up to 4,000 ft. absent from the wetter parts. Height 80 ft. Diameter 2 ft. Occurs over the greater part of India, Burmah and Ceylon.

Leaves renewed in Feb.—March. Flowers after renewing its leaves. Fruit June—September.

Bark $\frac{1}{2}$ in thick, grey or brown often scaling off. Wood moderately hard, dirty white when cut, turning yellow or brown and streaked with patches of darker colour. Pores small in radial lines of 1 to 4. Rays fine. short, numerous. Transverse lines faint.

W = 47 lbs. (Gamble)

Brandis says that the "wood is beautifully variegated with black" "and yellow streaks, hard and durable, a beautiful furniture wood." "Twigs and leaves lopped for fodder in Oudh. The fruit has an" "unpleasant smell, a bitter taste and a viscid bitter pulp: it is not" "eaten." (Brandis For. Fl. 297). The wood seems vary to a great deal. Some writers say that, though it is handsome, it is not durable and suffers from the attacks of insects, and there seems to be some doubt if there are not 2 species referred to under one name. It is not used in Travancore. The Hillmen utilise the fruit for stupefying fish.

372 8. **D. sylvatica**, Roxb; Fl. Br. Ind. iii. 559, Bedd. Fl. Syl. cxliii, Trimen Fl. Cey. iii. 98. Gamble Man. 457. Brandis Ind. Tr. 431.

Leaves 3-5 in. by 2-$2\frac{1}{2}$ in. ovate-acuminate, tapering to the base and slightly decurrent, glabrous. venation reticulate. Petiole $\frac{1}{4}$ in. flattened. Flowers 4-merous (or 3) white and fragrant, bell-shaped, $\frac{1}{8}$ in. long, male 7-15 together in cymes about 1 in. long stamens 12-22 often in 2s or 3s, female solitary or 3 together, staminodes 4, ovary 6-8-celled. Fruit $\frac{3}{4}$ in. globose. smooth, dark grey, calyx enlarged, foliaceous, nearly flat, endosperm ruminate, seeds brown, streaked.

A medium-sized tree occasionally found in our forests at 2,000-4,000 ft. Height 60 ft. Diam. 1 ft. Occurs also in Orissa, N. Kanara and southwards along the Western Ghauts and in Ceylon.

Flowers in April-May.

Gamble says that the bark is "thin, blackish-grey with white" "patches, smooth except for a few horizontal lenticels, wood grey" "with black streaks and irregular black patches in the centre," "moderately hard. Pores scanty in short radial lines. Medullary" "rays fine, numerous and regular, crossed by clear, fine, wavy," "transverse lines."

Wright says that "the timber though inferior in quality is some-" "times used in fancy work. The fruits when ripe are a trifle fleshy." "they are occasionally eaten." (Ann Perad. Gard. ii. 174.)

W=50 lbs. (Gamble).

Not used in Travancore.

9. **D. orixensis**, Wight, Fl. Br. Ind. iii, 571, Gamble Man Tim. 458 (under *D. humilis*), Bourdillon in Journal Bombay N. H. S. xii. 352 (under *D. humilis*), Brandis Ind. Tr. 432 Tam. *Vellei thuvarei* Mal. *Meruválan*. 373

Leaves 1-3 in. by ½-1 in. oblong-lanceolate, acuminate, glabrous above, branchlets and underside of leaves pubescent. Petiole 1/12 in. Flowers white. 4-merous in axils of present or fallen leaves. ⅓ in. long, male 6 or 8 together in small clusters, stamens 16-20 united in a column, anthers oval, female solitary or 2 together. calyx-segments black, staminodes 4 ovary, 4-celled. Fruit ½-¾ in. ovoid, glabrous, green, calyx not enlarged, endosperm equable.

A small tree of the evergreen forests near Ponmudi, found at 2,000 ft. rare. Height 50 ft. Diam. 1 ft. Found also in Tinnevelly.

Flowers March—April. Fruits May—June.

Bark ¼ in. black, green and dark grey mottled. No black heart. Wood hard, dull greyish-brown tinged with purple, and streaked with black, with small patches of black near the centre, coarse and rough. Pores scanty, small, in 2 s and 3 s along the radial lines. Rays extremely fine, regular and close together, crossed by fine, wavy lines of paler tissue.

W=54 lbs. P=579.

The wood is not used.

10. **D. Toposia**, Ham; Fl. Br. Ind. iii. 556; Bedd. Fl. Syl. cxliv; Trimen Fl. Cey. iii. 102; Gamble Man. Tim. 454; Brandis Ind. Tr. 432. 374

Leaves 4-8 in. by 1⅓-3 in. ovate-lanceolate, tapering or rounded at both ends, glabrous. venation reticulate, pellucid, bright green, paler beneath. Petiole ½ in. Flowers pale yellow, 4-merous, in axils of new or fallen leaves, ⅓ in. long; male in few-flowered pedunculate cymes, stamens 18-32; female solitary, staminodes 12-16, ovary hairy, 4-6 celled. Fruit 1-2½ in. ovoid, green, covered with a scurfy pubescence, calyx enlarged, flat, seeds brown, endosperm equable.

A large tree of the evergreen forests of Tinnevelly and probably to be found in Travancore. Found also in E. Bengal, Burmah and Ceylon.

Flowers in March (Ceylon).

Bark thick, black or dark greyish-brown, "Wood red when freshly" "felled, deepening to reddish-brown on exposure. Black heartwood" "rarely of great size, usually numerous black strands irregularly" "distributed through the brown wood. The ripe fruits are steeped" "in water and afterwards eaten by natives. The timber of freshly" "felled trees often yields large quantities of a gummy extract repu-" "ted to be efficacious for toothache." (Wright Ann. Perad. Gard. ii. 145.)

375 11. D. **affinis** Thw; Fl. Br. Ind. iii. 566; Bedd. Fl. Syl. cxlv. Trimen Fl. Cey. iii. 102; Gamble Man. Tim. 460; Brandis Ind. Tr. 433.

Leaves 1½-3½ in. by ½-2 in. oblong-oval, apex obtuse. narrowed at base, glabrous and shining, coriaceous, venation reticulate. Petiole ⅓ in. flattened. Flowers yellowish-white, 4-merous, axillary; male ⅓ in. clustered 3-7 together, stamens 6-16, equal: female larger, solitary, staminodes 6-8. ovary 6-8 celled. Fruit 1 in. globose, apiculate, glabrous, calyx enlarged. seeds dark brown, shining, endosperm ruminate.

A medium-sized tree of the evergreen forests of Tinnevelly, and probably, to be found in Travancore. Occurs also in Ceylon.

Flowers June—August. Fruits July—October (Ceylon).

Bark black peeling away in irregular patches. Heartwood black streaked with brown but generally very small. (Wright Ann Perad. Gard ii. 196). Beddome says that it is a good building timber.

376 12. D. **Ebenum**, Kœning; Fl. Br Ind. iii 558; Bedd. Fl. Syl. t. 65; Trimen Fl. Cey. iii. 94; Gamble Man. Tim. 456; Brandis Ind. Tr. 434. Eng. *The Ceylon Ebony tree* Tam. *Karunkáli*. Mal. *Karu*; *mushtimbi*.

Leaves 2-6 in. by 1-2½ in. oblong-lanceolate, acute or rounded at apex, usually narrowed at base. coriaceous, thick, glabrous, bright green and shining above, paler beneath. venation reticulate, pellucid, often appearing as if sprinkled with fine charcoal (Broun). Petiole ¼ in. glabrous. Flowers sub-sessile, greenish-yellow, 4-merous (rarely 3); male ½ in. 3-15 clustered together calyx glabrous. hardly lobed. stamens about 16. very unequal, connate in 2 s and 3 s, anthers acuminate, connective produced: female solitary, larger than male, staminodes 8, ovary glabrous 8-celled. Fruit globose ¾ in. glabrous, calyx enlarged and forming a shallow wooden cup, from the back of which project the acute segments, seeds ⅜ in. black, endosperm equable.

The true Ebony is a tree of the dry regions, and has only been found in Travancore in the Anjinaud Valley in the North, but it may also occur on the slopes above Puliyara and near Panagudi. It is a large evergreen tree with a dense leafy head. and sometimes attains a height of 80 ft. and a diameter of 2½ ft. Occurs also in the Deccan and Carnatic and in Ceylon. Under favourable circumstances the tree attains a total girth of 14 ft, in Ceylon and the largest log of Ebony, with the sapwood removed, seen by Broun was 7 ft. in circumference. According to the same observer the proportion of black wood to the gross volume of the trees examined varied from ·14 to ·35, an average of less than a quarter. The rate of growth is slow as the following figures show.

A tree probably reaches a girth of	18 inches.	at 25	years.
	36 do.	at 75	years.
	54 do.	at 135	years.
	72 do.	at 200	years.

(Broun in Indian Forester xxv. 277).

"Ebony prefers a rocky well-drained soil, and is found chiefly in" "company with other species of *Diospyros*, *Satinwood* &c. It is" "never found to be gregarious. Seedlings are shade-enduring, but" "require to have the cover removed when they are established." (Gamble)

This tree produces the best Ebony and is the "only one giving a" "black wood without either streaks or markings. As shown above" it is a very rare tree in Travancore, and this and the next are regarded as Royal timbers.

Flowers in March (in Ceylon) but there seems to be much irregularity about the flowering. Fruit about January.

"Bark dark grey, finely cracked longitudinally. Sapwood grey" "often streaked with black, soft, heartwood very hard, jet black," "close. and even-grained. Pores small, scanty, in radial lines." "Medullary rays very fine, numerous equidistant. Transverse bars" "very fine, indistinct." (Gamble).

The weight of the heartwood varies between 61 and 90 lbs. Gamble gives an average of 74 lbs. and quotes Mendis for P=720, but the latter figure is not confirmed, and the proper value of P is probably considerably more.

Ebony has been used from time immemorial for furniture turnery, cabinet-work, the keys of pianos, the backs of brushes &c. and there is a large export to China from Ceylon for the purpose of making chopsticks, opium-pipes and carved work. About 300 tons a year are shipped from that island, the price ranging from Rs. 150 to 210 per ton with an average of Rs. 180-185.

13. **D. assimilis** Bedd. Fl. Br. Ind. iii. 558. Bedd. Fl. Syl. t. 65; Gamble Man. Tim. 454; Brandis Ind. Tr. 434, Eng. *The Malabar Ebony tree.* Tam. *Karunthâli.* Mal. *Karu: mushtimbi* 377

Leaves 1-4 in. by $\frac{3}{4}$-$1\frac{1}{4}$ in. oblong, acuminate, glabrous, coriaceous. thin, bright green, venation reticulate. pellucid. Petiole $\frac{1}{4}$ in. Flowers pale yellow, 4-merous: male $\frac{1}{3}$ in. clustered 2-10 together calyx pubescent, deeply lobed, stamens 24-32, unequal, several together, connective not produced; female solitary, larger, ovary 8-celled. Fruit not seen.

A large evergreen tree, thinly scattered through the evergreen forests from 1000-3000 ft but no where common, conspicuous by its black bark. Height 70 ft. Diam. $2\frac{1}{2}$ ft. Occurs in the forests of the Western Ghauts.

Flowers February-April—Fruits July-August.

Bark black, thin, much cracked Sapwood greyish-white; heartwood jet-black with grey and brown streaks, very hard straight-grained, even and smooth. Pores extremely small in radial lines. Rays very fine, numerous and equidistant. Transverse bars indistinct.

W=69 lbs. P=1160.

Note.—Some Botanists consider *D. Ebenum* and *D. assimilis* to be the same species, and hold that the chief differences between them are due to the effects of climate.

This also is a royal timber. It is a valuable and ornamental wood and is used for the same purposes as the Ceylon Ebony. The timber is not ordinarily brought to the depots for sale, but is procured when required for Government purposes. In young trees the sapwood is very thick and the heartwood is represented by a small block, a few inches in diameter, in the centre. Logs squaring more than 1 foot of sound black wood are difficult to procure. In order to examine the thickness of the heartwood the felling men often cut notches into the centre of the tree. This practice should on no account be allowed as it almost invariably sets up decay.

The local value of this wood is about Rs. 2 4 as. per cub. ft. in log.

378 14. **D. Embryopteris,** Pers: Fl. Br. Ind. iii. 556; Bedd. Fl. Syl. t. 69; Trimen Fl. Cey. iii. 93; Gamble Man. Tim. 455; Brandis Ind. Tr. 434. Tam. and Mal. *Paniccha.*

Leaves 5-8 in by 2-3 in. oblong, tapering to base, obtuse or subacute, glabrous bright green when young, very dark green and coriaceous when mature, venation pellucid. Petiole thick, $\frac{1}{3}$ in. Flowers pale yellow 4- (or 5-) merous, fragrant: male $\frac{1}{2}$ in- growing in axillary cymes of 3-6. stamens 30 60, unequal, anthers linear. connate in pairs: female 1 in. across. much larger than male flowers, solitary or few. staminodes 4-12. ovary hairy, 8-celled. Fruit $1\frac{1}{2}$-3 in yellowish-red, globose, supported by the enlarged, green calyx, segments covered with a rusty tomentum, seeds 5-8 embedded in a glutinous pulp, endosperm equable.

A medium sized ever-green tree common on river-banks and backwaters throughout the low country, often with numerous stems and shrubby, frequantly cultivated. Height 50 ft. Diam. $1\frac{1}{2}$ ft. Occurs also through India, Burmah and Ceylon.

A very dark variety (var. *atrata.* Thw.) is found in the evergreen forests at elevations from 1,500 ft. and upwards. The buds, inflorescence and calyx are covered with long black hairs, giving the tree a sooty appearance. It is otherwise the same.

Flowers January-May Fruits June-Dec.

Gamble says: "Bark smooth, dark grey, almost black with a "greenish tinge. Wood gray with darker streaks and a darker" "irregular patch in the centre, moderately hard. close-grained." "Pores small, scanty, sub-divided or in short, radial lines. Medul-" "lary rays very fine, very numerous. Transverse bars very faint or" "wanting." and he gives.

W=46 lbs.

The wood is not used in Travancore, but Beddome and Trimen say that in South India and Ceylon it is employed for building, but is inferior. The sticky gum which exudes from the fruits is used for caulking the seams of fishing-boats and for rendering fishing lines durable. "It is full of tannin and is used in dyeing and" "tanning and in medicine as an astringent." The fruit also is used in Bengal as a tan and is sometimes eaten though not very palatable. "The oil extracted from the seeds is used in native medicine." (Gamble,)

15. D. **foliolosa**, Wall: Fl. Br. Ind. iii, 556; Bedd. Fl. Syl. t. 68 (under D. *calycyna*); Gamble Man. Tim. 456. Brandis Ind. Tr. 434. Tam. *Vellei thuvarei*. 379

Leaves 2-4 in. by ¾-1¼ in. oblong or lanceolate, acuminate, tapering to the base, glabrous and shining above, venation reticulate. Petiole ¼ in. or less. Flowers 4-merous, bright yellow: male ¼ in. or less, stamens 12-16, in pairs, equal; female solitary on long peduncles, larger than male, staminodes none, ovary 4-celled. Fruit ⅜ in. globose, glabrescent, calyx enlarged, foliaceous, lobes ⅜ in. long and broad, endosperm equable.

A medium sized tree of the evergreen forests about Ariyankavu, rare. Height 60 ft. Diam. 1½ ft. confined to the hills of Tinnevelly and S. Travancore.

Flowers Dec.—Feb. Fruits April—May.

Gamble says that the "bark is dark brown, smooth. Wood" "yellowish-white, clouded with grey and occasionally black, hard." "concentric lines not vissible. Pores very small, scanty in radial" "arrangement. Medullary rays very fine, very close, numerous."

The timber has not been weighed or tested.

16. D. **Candolleana**. Wight. Fl. Br. Ind. iii. 566. Bedd. Fl. Syl. cxliv. Gamble Man. Tim. 462. Brandis Ind. Tr. 432. Mal. *Kari*. 380

Leaves 3-7 in. by 1½-3 in. oblong, cuneate at both ends. glabrous and very dark green when mature, but when young with fibrous, closely adpressed hairs beneath. Petiole ½ in. Flowers pale yellow, 5-merous: male ⅓ in. tomentose without, in dense fascicles, stamens 10 in. unequal pairs, one of each pairs sessile and the other filamentous: female ½ in. 1 5 together in sessile clusters, in the axils of leaves or on the branches. staminods 5, ovary 4-celled. Fruit conical. glabrous, green, 1 in. long. calyx not enlarged, woody. endosperm ruminate.

A medium-sized tree with smooth greenish-black. bark and dark green foliage, common in the ever-green forests everywhere at elevations below 1500 ft. Height 40 ft. Diam. 1 ft. Found also in Kanara and on the Western coast, but not in Ceylon.

Flowers Feb—July. Fruits June—Nov.

Bark ¼ in. thick. Wood light pink with grey streaks or lines, smooth. hard. no black heart. Pores scanty, small, often in 2 s and 3 s, arranged in radial lines. Rays fine, pale, uniform and closely packed, crossed by thin wavy bands of paler tissue.

W.=58 lbs.

The wood is not used.

17. D. **ovalifolia**, Wight. Fl. Br. Ind. iii. 557. Bedd. Fl. Syl. cxliii. Trimen Fl. Cey. iii. 91. Gamble Man. Tim. 454. Brandis Ind. Tr. 435. 381

Leaves 2-5 in. by $\frac{3}{4}$-2 in. oblong, lanceolate, tapering to base, apex obtuse or rounded, glabrous, dark green above, paler beneath, venation prominent on the underside. Petiole $\frac{1}{4}$ in. Flowers pale yellow 4-or 5-merous. male $\frac{1}{4}$ in sessile, clustered in axils of fallen leaves. stamens 14-20, paired, unequal. female rather longer, 3-9 together staminodes either 4 or absent, ovary hairy 4-celled. Fruit globose $\frac{3}{4}$ in, long glaucous-green, calyx reflexed, not enlarged, densely tomentose, endosperm equable.

A small evergreen tree seen in the neighbourhood of Ariyankavu at 1000 ft rare. Height 30 ft. Diameter 1 ft. Found also in the Neilgherries, Anamalays, in Tinnevelly and in Ceylon.

Flowers in May (Sep.-Dec. in Ceylon). Fruits Sept.-Oct.

Trimen says that "the heartwood is brown streaked with black" "very inferior to true ebony." Wright describes it as 'brown or dirty white" or "faint red in colour, inferior" and adds "many specimens show thinly streaked heartwood, the black lines of which help to form a pretty pattern." (Wright Anns of Perad Gard ii 135)

382 18. **D. Bourdilloni**, Brandis. Bedd. Fl. Syl. cxlvi (under *D. ramiflora*), Gamble Man. Tim. 459 (W. 4684), Brandis Ind. Tr. 435. Tam. *Karunchithi: karuthuvara.* Mal. *Kari: kodal: therikka.*

Young shoots strigose, leaves 3-6 in. by 1-2 in. oblong-lanceolate, shortly acuminate, pink, when young. at length dark green above. paler beneath, glabrous, coriaceous. Petiole $\frac{1}{4}$ in, Flowers 5-merous white: male $\frac{1}{2}$ in long in short. rusty-tomentose, axillary cymes, or on the old wood 2-8 together, stamens equal 12-18: female broader than male, in compound cymes 4-10 together on 1 in pedicels on the stem and stout branches, staminodes 10. ovary tomentose, 10 celled. Fruit 3 in. diam, hard, woody, globose, dark green, supported by the woody, pentagonal calyx $1\frac{1}{2}$-2 in. across, sessile on the stem and branches.

A large tree with a black, rough, fluted stem and thick drooping foliage, common in our ever-green forests up to 2,000 ft. Height 80 ft. Diameter 2 ft. Found by Beddome on the Anamallays and in Tinnevelly.

Flowers Feb.-April. Fruits hang on the tree for fully a year and ripen June-Sep. so that female trees only flower freely every other year.

Bark black $\frac{1}{8}$ in. thick. Wood yellowish-grey with irregular rings of black shaded into brown, coarse, very hard, liable to crack, with a very small patch of black wood in the centre. Pores small, numerous, in short radial lines of 3-5. Rays fine, regular and closely-packed, crossed by fine wavy transverse lines.

W = 54 lbs. P = 785.

The wood is not used.

383 19. **D. sucata** sp. nov; Brandis Ind. Tr. 713 (under *D. sp. nova*) Mal. *Kari.*

Leaves 6-9 in. by 2.4 in. oblong or oblong-lanceolate with a sudden acumination, tapering to base, coriaceous, glabrous above and

beneath, venation pellucid Petiole $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers 5-merous ; male not seen ; female $\frac{1}{3}$ in. solitary or 2-5 together sessile on the old wood or in axils of leaves, staminodes 5, ovary 10-celled, covered with dense brown tomentum, stigmas 5. Fruit a truncate cone $1\frac{1}{4}$ in long 1 in. diam, at base, $\frac{1}{2}$ in. at apex, at first covered with rusty tomentum, at length glabrous, marked with 8-10 deep longitudinal grooves, calyx green. coriaceous, somewhat enlarged, endosperm equable.

A rare tree of small size found in the valley of the Ranni river and elsewhere at low elevations in evergreen forests. Height 30 ft. Diam 1 ft.

Flowers Feb—Mar. Fruits. Dec.—Jan,

Bark blackish grey, smooth, $\frac{1}{3}$ in. thick. No black heart. Wood hard brownish-pink with occasional lines of black. Pores numerous in radial lines.

W = 54 lbs. P = 519.

The wood is not used.

Besides the above I have 2 or more species of Diospyros which may be new, but the material collected is insufficient for identification or a full description. One of these, called by the Hillmen *Neyárum* has very fragrant white flowers and ovate leaves. It is to be found in evergreen forests on the banks of the Periyar near Thattakad.

Order LII. STYRACEÆ.

Trees with alternate, simple, entire or dentate, exstipulate leaves, and buds with external scales. Flowers regular, bisexual, in axillary or terminal spikes or racemes, sometimes solitary Calyx-tube adnate to ovary, segments 4-5, small, imbricate. Corolla-tube reduced to a ring, lobes 4-5, imbricate. Stamens adnate to the petals, numerous in several series, filaments often unequal. Ovary inferior or superior, 2-5-celled, style filiform, with 2 pendulous ovules in each cell. Fruit, a drupe, 1-3-seeded, endocarp woody, seed with abundnant endosperm.

To this Order belong 8 trees indigenous in Travancore. They are small trees of the evergreen forests, chiefly at the middle and higher elevations. The wood is white and soft. The Order includes several species of *Styrax* as S. *Officinale* from the Levant and *S. Benzoin* from Borneo yielding fragrant resins, but none are found in Western India. The bark and leaves of several foreign species are used for producing a yellow dye.

SYMPLOCOS, Linn.

Trees with 5-merous flowers, ovary 3-(rarely 2)- celled, inferior Other characters as in the Order.

Petals free or nearly so. Flower-buds sub-globose.
- Flowers solitary or 2. axillary ... ... 1. *S. villosa.*
- Flowers in axillary fascicles or short spikes less than $\frac{1}{2}$ in....2. *S. oligandra.*

Flowers in undivided spikes over ½ in.
Fruit densly villous, under 1 in. purple ...3. *S. Gardneriana.*
Fruit glabrous, smooth over 1 in. white ...4. *S. macrocarpa.*
Fruit Glabrous, smooth, ¾ in. rose-coloured ...5. *S. rosea.*
Flowers in compound spikes or racemes ...6. *S. spicata.*
Petals connate into a tube. Flower-buds elongate.
Flowers pendulous in 1-5 flowered peduncles ...7. *S. pendula.*
Flowers erect, sessile, solitary ...8. *S. sessilis.*

384 1. **S. villosa**, Brand; Brandis Ind. Tr. 437.

Leaves 2-3 in. by 1-1¼ in. pale green, lanceolate, slightly dentate, hispid, young shoots and midrib beneath covered with soft hairs. Petiole ¼ in. Flowers white, solitary. ⅓ in. across, subsessile, axillary or terminal, calyx green, hairy, each flower supported by 6-10 villous bracts, stamens about 50. Fruit cylindrical ⅔ in. long ¼ in. diam. crowned by the villous calyx segments.

A small, much-branched tree found only in the evergreen forests of Peermade at 3,500 ft. Height 30 ft. Diameter 8 in. Endemic.

Flowers and fruits December to March.

The properties of the tree are unknown.

385 2. **S. oligandra**, Bedd; Fl. Br. Ind. iii. 574; Bedd, Fl. Syl. cl; Gamble Man, Tim. 464; Brandis Ind. Tr. 438.

Leaves 1½-2 in. by ⅔ in. oblong, base cuneate shortly acuminate, coriaceous, glabrous on both sides, shining above, pale beneath. Petiole ⅕ in. Flowers white, small, in very short axillary racemes. 3-6 together. bracts minute, corolla glabrous. stamens 12-14 in pairs, ovary hairy. Fruit unknown.

A small tree found by Beddome in the evergreen forests at 3,000-5,000 ft, not seen by me. Endemic in Travancore and Tinnevelly. The wood is unknown.

386 3. **S. Gardneriana**, Wight, Fl. Br. Ind. iii 582; Bedd. Fl. Syl t. 237; Gamble Man. Tim. 464; Brandis Ind. Tr. 430,

Young branches covered with rusty tomentum, leaves 3-7 in. by 1½-3 in. ovate. acuminate. base cuneate, slightly crenulate or subentire, coriaceous, glabrous above, softly pubescent beneath with veins very prominent and densely tomentose. Petiole ¼ in. villous. Flowers white ⅓ in. across. crowded in simple, axillary spikes about 2 in. long, bracts small, calyx villous, stamens about 50. Fruit ⅓ in. long, cylindrical densely hairy, purple when ripe.

A small tree of the evergreen forests at 3,000 ft. Height 40 ft. Diam 1 ft. Found also on the Western Ghats and the Neilgherries at elevations above 3,000 ft.

Flowers Feb—March. Fruit April—May.

Beddome says that the leaves yield a dye, and that the timber is said to decay very rapidly.

387 4. **S. macrocarpa,** Wight; Fl. Br. Ind. iii. 582; Gamble Man Tim. 466; Brandis Ind. Tr. 439. Tam. *Paralei*; Mal. *Malam parala*.

Leaves 2-6 in. by 1-2 in. oblong, narrowed to both ends, bright green, glabrous and shining, crenulate Petiole $\frac{1}{3}$ in. Flowers white, $\frac{1}{3}$ in. across, 1-4 together in short axillary or terminal spikes, with one bract to each, stamens about 40. Fruit cylindrical-ovoid, 1 in. by $\frac{2}{3}$ in white, very smooth and glabrous.

A much-branched tree common in the evergreen forests of Ariyankavu and Kulathupuzha up to 2,000 ft. and more. Height 50 ft. Diam 1 ft. Found also in the Western Ghauts and in Tinnevelly.

Flowers March—April. Fruits Dec.—Feb.

Bark smooth. Wood white, soft, even-grained but rather rough. Pores small, very abundant and evenly distributed. Rays of two kinds, moderately broad and very fine mixed together.

W=31 lbs. P=455.

The wood is useless.

5. **S. rosea**, Bedd., Fl. Br. Ind. iii. 583; Bedd. Fl. Syl. cl.; 388
Gamble Man. Tim. 464; Brandis Ind. Tr. 440.

Leaves 2-5 in by 1-2½ in oblong, acuminate, serrate, bright green and very glabrous, young parts pubescent, nerves distant about 4 pairs. Petiole $\frac{1}{3}$ in. Flowers rose-pink, $\frac{1}{4}$ in. across in axillary racemes 1-2 in. long, stamens numerous. Fruit cylindrical. $\frac{3}{4}$ in. long, rose-red, glabrous and shining, crowned with the calyx segments.

A much branched tree or small shrub very common in the evergreen forests from 1,000-3,000 ft. Height 20 ft. Diam. 6 in. Also on the Anamallays.

Flowers Dec.—Jan. Fruits March—May.

The properties of the tree are unknown.

6. **S. spicata**, Roxb.; Fl. Br. Ind. iii 573 Bedd Fl. Syl. cxlix 389
Trimen Fl Cey. iii 104; Gamble Man Tim. 465; Brandis Ind. Tr. 441. Tam. *Kambly vetti*.

Leaves 3-6 in by 1-2 in. ovate-lanceolate, obtuse or shortly acuminate, narrowed to base, bright green, entire or irregularly toothed, glabrous and shinning. Petiole $\frac{1}{3}$ in. Flowers white, fragrant, small, 10-12 together, sessile with 3 small bracts at base of each, arranged in compound axillary spikes 2-3 inches, long, stamens about 40. Fruit $\frac{1}{4}$ in. glabrous, purple, globose and faintly ribbed.

A tree of medium size, very common in the evergreen forests and sholas, sometimes only a shrub. at all elevations from 0-7,000 ft. Height 60 ft. Diam 2 ft. Found also through India and Ceylon and in China and Japan.

Flowers Dec.—May. Fruits April—June.

"Bark light grey, thin, smooth. Wood white, soft even grained" "Pores small, evenly distributed. Medullary rays of two classes," "few fine, short, many very fine" (Gamble)

W.=37 lbs.

The wood is not used except for fuel. The seeds are strung as beads and used to put round children's necks to avert evil (Roxburgh), Trimen says that the wood is liable to split, a decoction of the bark is used as an external application and the leaves afford a dye.

390 7 S. **pendula**, Wight Fl. Br Ind. iii. 587, Bedd. Fl. Syl. clii, Brandis Ind. Tr. 441.

Leaves $1\frac{1}{2}$-$2\frac{1}{2}$ in. by 1-$1\frac{1}{2}$ in. ovate-lanceolate, coriaceous, glabrous sub-entire. cuneate at both ends. Petiole $\frac{1}{6}$ in. Flowers white, $\frac{1}{2}$ in. across, 1-5 together on short peduncles, pendulous with numerous persistent bracts, stamens about 50. Fruit not seen.

A small tree of the evergreen forests at high elevations from 4,000-6000 ft. Height 30 ft. Diam. 6 in. Found also in Malabar.

The uses are unknown.

391 8. **S. sessilis.** Clarke ; Fl. Br. Ind. iii. 587 ; Brandis Ind. Tr. 441. Leaves 1-$2\frac{1}{2}$ in. by $\frac{1}{2}$-1 in. entire, spathulate, obtuse or emarginate, tapering to base. glabrous, coriaceous. Petiole $\frac{1}{4}$ in. Flowers $\frac{1}{3}$ in. across white. solitary, sessile, erect in the axils of the leaves Fruit cylindrical, $\frac{3}{4}$ in. long by $\frac{1}{6}$ in. glabrous, black and shining.

A medium sized tree common on the Muthukuli Vayal Plateau at 5,000 ft. in evergreen forests. Not seen elsewhere. Height 40 ft. Diam. 1 ft. Endemic.

Flowers in October. Fruits in March.

The tree is rare and the timber unknown.

ORDER LIII. OLEACEÆ.

Trees with opposite, simple or compound, entire or toothed leaves without stipules. Inflorescence in panicles or racemose, axillary or terminal. Flowers regular, bisexual, or unisexual often dimorphic. Calyx free, usually small, segments 4 or more. Corolla-lobes 4 imbricate or valvate. or with distinct petals. Stamens 2, filaments short. Ovary free, 2-celled, ovules 1 or 2 in each cell. Fruit a drupe or berry.

A small Order of no importance, containing 7 indigenous trees. To it belongs *Olea europæa* the "Olive," which produces the valuable olive oil of Italy and Southern Europe, and *Fraxinus excelsior* the "Ash" one of the best English timbers. It also includes many species of *Jasminum*, climbers with fragrant flowers.

Corolla-tube very short ; petals usually in pairs	1. *Linociera*
Corolla tubular or absent : inflorescence axillary	2. *Olea.*
Corolla funnel-shaped : inflorescence terminal	3. *Ligustrum.*

1. LINOCIERA, Swartz.

Trees with simple, entire leaves, and small flowers in axillary panicles or cymes, corolla-lobes linear, split to base and connate in pairs, valvate. Stamens at base of corolla. Ovules 2 in each cell. Drupe ovoid, seed solitary.

Pedicels and calyx-pilose, ovary hairy	1. *L malabarica.*
Pedicels and calyx glabrous, ovary glabrous.	
Flowers in panicles: fruit ½ in. smooth	2. *L. Wightii.*
Flowers in racemose cymes: fruit 1 in. covered with scales	3. *L. courtallensis.*

1. L. malabarica, Wall; Fl. Br. Ind. iii. 607; Bedd. Fl. Syl. cliv under (*Chionanthus malabarica*), Gamble Man. Tim. 473; Brandis Ind. Tr. 448.

Leaves 3-6 in. by 1-2½ in. broadly-lanceolate with a sudden acumination or obtuse, glabrous on both sides, coriaceous. young parts pilose Petiole ⅙-⅓ in. Flowers ¼ in., white. on 1-5-flowered, hairy cymes, on 1 in peduncles. Calyx and pedicels grey-pilose, petals linear. Ovary hairy. Drupe ovoid ½ in. 392

A medium-sized tree of the evergreen forests at 2,000-4,000 ft, Height 40 ft, Diam. 1 ft. Also found on the Western Ghauts and in Tinnevelly.

Flowers in Jan-Feb. Fruits March-May.

Gamble says that the wood is "yellowish white. very hard close" "grained with a satiny lustre. Pores small, single or in short radial" "lines. Medullary rays very fine and white, very numerous." "Narrow fine. white concentric lines, like annual rings fairly" "numerous and he gives."

W=65 lbs,

"A fine wood, very like boxwood" but not used.

These three species are much alike. and further investigation may prove that they are local varieties of the same species.

2. L. Wightii, Clarke; Fl. Br. Ind. iii. 608; Bedd. Fl, Syl. clli (under *Olea linocerioides*), Gamble Man. Tim. 472, Brandis Ind. Tr. 448. Tam. *Masseri.* 393

Leaves 3-4 in. by 1½-2 in. ovate-acuminate, base cuneate. coriaceous. glabrous. Petiole ½ in. Flowers ¼ in. white. in short, axillary panicles, calyx glabrous. edges of segments ciliate. Drupe ovoid. smooth, ½ in. long.

A small tree common about Pullyera at 1,000 ft. in evergreen forest. Height 30 ft. Diam. 6 in. Found also in Tinnevelly, S. Arcot and the Western Ghauts.

Flowers in January.

Properties unknown.

3. L. courtallensis, Bedd; Fl. Br. Ind. iii. 608 (under *L. leprocarpa*); Bedd. Fl. Syl. cliv and clv (under *Chionanthus leprocarpa* and *C. courtallensis*); Gamble Man. Tim. 472 (*L. leprocarpa*); Trimen Fl. Cey. iii, 117; Brandis Ind. Tr. 441. Tam. *Kal idalei.* 394

Leaves 2-5 in by 1-2½ in. oblong-lanceolate. tapering to base with a long acumination, glabrous, coriaceous, pale when young, dark green when mature. Petiole under ¼ in. stout Flowers ¼ in. small white, on short racemose cymes 1 in. long, calyx glabrous, segments ciliate. Ovary glabrous. Drupe ovoid, 1 in. long, brownish-purple covered with small scales.

A medium-sized tree very common in the evergreen forests of the Peermade Plateau and the Cardamom Hills between 3,000-5,000 ft. Height 60 ft. Diam. $1\frac{1}{2}$ ft. Found also in Tinnevelly and Ceylon.

Flowers Jan.-Feb. Fruits March-May.

Properties unknown.

2. OLEA, Linn.

Trees with simple, entire or toothed leaves. Flowers unisexual or bisexual in axillary panicles. Calyx small. Corolla-tube short, lobes valvate. Ovary with 2 ovules in each cell. Fruits fleshy, seed one with copious endosperm.

395 **O. dioica**, Roxb.; Fl Br. Ind- iii. 612; Bedd, Fl Syl. cliii; Gamble Man. Tim 475, Brandis Ind. Tr. 447. Tam. *Yedalei* ; *parava idalei*. Mal. *Edana* ; *vidana* ; *pal arana*.

Leaves 4-8 in. by 2-4 in ovate-lanceolate, tapering to both ends, pink when young, at length dark green, glabrous, coriaceous, remotely toothed. Petiole $\frac{1}{3}$-$\frac{2}{3}$ in. Flowers creamy white, diœcious, in divaricate panicles from the leaf-axils, male numerous, $\frac{1}{8}$ in long, female similar, but fewer and rather narrower. Corolla present in both. Drupe ovoid $\frac{1}{2}$ in. long, glabrous, blue.

A medium-sized or large tree abundant at all elevations from 0-5,000 ft. both in deciduous and evergreen forests. When found in the former does not attain more than 50 ft. but in evergreen forest reaching 100 ft. and $2\frac{1}{2}$ ft. diam. Occurs also in the Deccan and in Assam and Bengal but not in Ceylon.

Flowers Jan.-Mar. Fruits April-June.

Bark brown rough, $\frac{1}{2}$. in. thick. Wood pale brown, straight and close-grained, elastic, hard, rather rough. Pores medium-sized, numerous, in radial lines of 2-6. Rays very fine, numerous, crossed by white, concentric, wavy lines. Annual rings marked by bands of smaller pores 5 to the inch.

W=49 lbs. P=581.

Apparently an excellent wood but, though so common, it does not seem to be used.

3. LIGUSTRUM, Linn.

Trees with simple entire, glabrous leaves, branches generally covered with lenticels. Flowers bisexual in terminal panicles. Calyx small, Corolla funnel-shaped, lobes valvate. Ovary with 2 ovules in each cell, style long. Drupe 1-2-seeded.

Flowers less than 1/6 in., Corolla-tube equalling calyx small.
- Panicle stout, compact flowers sessile. . 1. *L. Roxburghii.*
- Panicle long, slender flowers pedicellate . 2. *L. Walkeri.*

Flowers exceeding 1/6 in. Corolla-tube twice the length of calyx 3. *L. Perrottetii.*

1. **L. Roxburghii**, Clarke ; Fl. Br. Ind. iii. 615 ; Bedd. Fl. Syl. cliii (under *L. robustum*) ; Gamble Man. Tim. 475 ; Brandis Ind. Tr. 447. 396

Leaves 2-4 in. by $\frac{1}{3}$-$1\frac{1}{2}$ in ovate or lanceolate, acuminate, coriaceous. Petiole $\frac{1}{2}$ in. Flowers $\frac{1}{6}$ in long, white, sessile in compact panicles. Drupe ovoid, purple $\frac{1}{3}$ in, long.

A small tree or large shrub with very variable leaves, common on the Cardamom Hills and elsewhere in evergreen forests between 3.000-5,000 ft. Height 20 ft. Diam. 6 in. Also on the Neilgherries, but not in Ceylon.

Flowers and fruits Jan.—June.

Wood not known.

2. **L. Walkeri**, Dcne.; Fl. Br. Ind. iii. 614 ; Trimen Fl. Cey. iii. 119 ; Gamble Man. Tim 475 ; Brandis Ind. Tr. 447. 397

Leaves $1\frac{1}{2}$-3 in. by $\frac{1}{4}$-$1\frac{1}{4}$ in. ovate or lanceolate, tapering to base, apex very acute, thin. Petiole $\frac{1}{4}$ in. Flowers white, 1/10. in. long, fragrant, pedicellate, very abundant in erect terminal panicles 4-6 in. long. Drupe about $\frac{1}{4}$ in. ovoid, purple.

A small tree or large shrub common in the evergreen forests of the Cardamom Hills 3,000-5,000 ft. Height 20 ft. Diam 6 in. Also on the Neilgherries and in Ceylon.

Flowers and fruits Jan-May.

Wood unknown.

3. **L. Perrottetii**, A. Dc.; Fl. Br. Ind. iii. 615 ; Bedd. Fl. Syl. cxlii ; Gamble Man. Tim. 476 ; Brandis Ind. Tr. 447. Tam. *Pungan cheddi*. 398

Branches rarely lenticellate. Leaves $1\frac{1}{2}$-$2\frac{1}{2}$ in by $\frac{1}{2}$-$\frac{3}{4}$ in. lanceolate, tapering to both ends, coriaceous. Petiole $\frac{1}{2}$ in. Flowers white, $\frac{1}{4}$ in. long, in small, erect, pubescent panicles 3 in. by $1\frac{1}{2}$ in. Drupe $\frac{1}{3}$ in. ovoid, purple.

A small tree common in evergreen forests at 2000-3000 ft. often only a large shrub. Height 30 ft. Diam 8 in. also on the Neilgherries and other hills of Southern India.

Flowers and fruits January—May.

Gamble says that the bark is brown and smooth and the wood white, moderately hard with a satiny lustre. Pores small. Medullary rays fine and numerous.

ORDER LIV. APOCYNACEÆ.

Trees with opposite or whorled (scattered in *Cerbera*) entire, simple leaves, no stipules. Juice usually milky. Flowers regular, bisexual, in terminal and axillary cymes. Calyx free, segments 5 (rarely 4) imbricate. Corolla rotate, tube long or short, lobes 5 (rarely 4) contorted, throat often hairy or closed with scales. Stamens 5 alternating with corolla-lobes, filaments short, anthers often connivent. Ovary superior, usually of 2 distinct carpels or 1-2-celled. Fruit usually of 2 dehiscent follicles containing 1 or 2 or many seeds.

An important economic Order though the number of trees indigenous in Travancore is only 7. but it includes many shrubs and climbers. Not a few of the genera here and elsewhere yield a poisonous milky secretion, as in *Tanghinia venenifera* the "Ordeal plant" of Madagascar, and two species of *Nerium* (Oleander). In others the milk is bland and palatable and the fruit is edible (*Carissa &c.*) while in others it produces India rubber, such as *Vahea, Hancornia, Landolphia, Urceola* and *Willughbeia.*

Anthers free from stigma, cells rounded at base.
Fruit-carpels indehiscent, 1-2 seeded.
Fruit fleshy, leaves opposite .. 1. *Hunteria.*
Fruit fibrous-woody, leaves scattered .. 2. *Cerbera.*
Fruit carpels dehiscent, follicles many seeded.
Leaves whorled, seeds with a tuft of hairs at each end .. 3. *Alstonia.*
Leaves opposite, seeds with a tuft of hairs at one end .. 4. *Hollarhena.*
Leaves opposite seeds without hairs, surrounded by pulp .. 5. *Tabernaemontana.*
Anthers conniving in a cone round the stigma, cells produced downward in a spar .. 6. *Wrightia.*

1. HUNTERIA. Roxb.

Trees with opposite leaves and flowers in small axillary cymes. Calyx small, segments acute. Corolla-tube much inflated in the upper part, lobes much overlapping to the left. Stamens distinct, inserted on the upper part of the corolla-tube, anther-cells rounded at base. Carpels distinct with 2 ovules in each. Fruit beaked, fleshy, usually 2-seeded

399 **H. corymbosa,** Roxb; Fl. Br. Ind. iii. 637; Bedd. Fl. Syl. t. 265 (under *H zeylanica*); Trimen Fl. Cey. iii. 128; Gamble Man. Tim. 481; Brandis Ind. Tr. 457.

Leaves 3-5 in. by 1 in. oblong-lanceolate, base acute, apex acuminate or obtuse, pale green, glabrous and shining above, veins very numerous and parallel. Petiole $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers pale yellow $\frac{1}{3}$ in. long in terminal and leaf-opposed cymes. Carpels beaked, smooth yellow, seed ovoid $\frac{3}{4}$ in. long.

A small tree of the evergreen forests between 1,000-2,000 ft rare, Height 30 ft. Diam. 8 in. Occurs also in Tinnevelly, Ceylon and the Malay Peninsula.

Flowers in Jan.-Feb. Fruits May-June.

Gamble says that the bark is light brown, thin and smooth. Wood brownish-yellow, very hard, close and ever grained. Pores small, numerous, regularly distributed. Rays fine and very fine, numerous and he mentions that the wood has been used in Ceylon for wood-engraving.

"The leaves are used externally (in Ceylon) for wounds and cuts." (Trimen.)

2. CERBERA. Linn.

Trees with scattered leaves sometimes opposite and sometime, alternate, and flowers in large terminal panicles. Calyx-tube shorts

segments linear, recurved. Corolla funnel-shaped, lobes overlapping to the left. Stamens inserted about the middle of the corolla tube, anthers slightly connate about the stigma, but free from it. Carpels 2-lobed, usually solitary when ripe, nearly globose, with a thick, fibrous pericarp covered by a thin skin, seeds 1 or 2.

C. Odollam, Gærtn ; Fl. Br. Ind. iii. 638 , Bedd. Fl. Syl. clvii. 400
Trimen Fl. Cey. iii. 128 ; Gamble Man. Tim. 482 . Brandis. Ind. Tr. 457. Mal. *Othalam Chátthankai.*

Leaves 3-10 in. by 1-2½ in. lanceolate or oblanceolate, much tapering to the base, suddenly acuminate, bright green, glabrous and very shining, nerves numerous and parallel venation pellucid. Petiole ½-1½ in. Flowers white, 2 in, across, throat yellow nearly closed by 5 projecting wings, fragrant, on stout peduncles in flat-topped panicles. Ripe carpels 3 in. diam. ovoid, smooth, shining green with white specks.

A small tree very common on all the backwaters and often used as live fences between compounds. Height 20 ft. Diam. 6 in. Occurs on all the tropical shores of Asia, Africa and the Pacific Islands.

Flowers and fruits all the year round.

"Wood grey, very soft, spongy, annual rings marked by a sharp" "line. Pores small, in short radial lines. Medullary rays in-" "distinct." (Gamble).

W = 21 lbs.

"Growth fast 5-7 rings per inch of radius. The wood is only occasionally used for firewood. The seeds give an oil which is used for burning." (Gamble).

The tough, fibrous pericarp enables the fruit to float, and it is thus transported by water to great distances. The kernel of the seeds contains an irritant poison which produces vomitting and purging, and in some cases causes death.

Closely allied to the above is *Plumeria acutifolia.* The "Pagoda" tree. Mal. *Ealava shambagam* probably originally from America, but grown everywhere for its scented, white flowers.

3. ALSTONIA, Br.

Trees with leaves in whorls of 7. Flowers small in terminal, paniculate cymes. Calyx-tube short, segments imbricate. Corolla-tube cylindrical- lobes, overlapping to the left. Stamens inserted on the upper part of the corolla-tube Carpels 2, distinct, follicular, long and slender, seeds many, flat with a tuft of hairs at each end.

A. Scholaris, Br., Fl. Br. Ind. iii. 642. Bedd. Fl. Syl. t. 242. 401
Trimen Fl. Cey. iii. 133. Gamble Man. Tim. 483. Brandis Ind. Tr. 459. Tam. *Mukkam pálei: erlila pálei* Mal. *Pála*

Leaves 4-8 in. by 1-2½ in. oblong-lanceolate, acute at base, rounded or emarginate at the apex glabrous, bright green and shining above, paler beneath, nerves numerous and parallel. Petiole stout, ¼-⅓ in. Flowers ½ in. long greenish-white, with a very unpleasant

smell, sessile in small clusters, terminating the ends of the branches of erect panicles 3-4 in long. Follicles 12-18 in. long, very slender, cylindrical and pendulous, seed without its hairs $\frac{1}{4}$ in. long.

A very large buttressed tree of the deciduous and evergreen forests, very common at elevations between 0-2,000 ft. Height 100 ft. Diam. 3 ft. Occurs through India, Ceylon and the Malay Peninsula.

Flowers Nov.-Dec. and again in March if the weather is dry. Fruits Dec.-Jan. and April-May.

Bark greyish brown $\frac{1}{2}$ in. thick, covered with lenticels. Wood white, soft and perishable, becoming discoloured with grey streaks if left in log. Pores medium-sized, scanty, divided or 2 or 3 together in radial lines. Rays fine white, often bent, with intermediate very fine rays, crossed by pale, wavy concentric lines at unequal distances.

W = 27 lbs. P = 416.

The wood is sometimes used for packing cases, but it is liable to be eaten by white ants It has been tried for tea-boxes but is not so suitable as Cotton wood. In other parts of India it is used "for boxes, furniture, scabbards, and other purposes and is made into blackboards in Burmah" (Gamble). The bark is bitter and contains an active principle called "Ditain" which has been frequently prescribed for fever, and is said to be as efficacious as sulphate of Quinine with fewer after-effects. The bark is also used in chronic cases of diarrhea and dysentery and the leaves as poultices or ulcers (Dict. Econ. Prod., 1. 198.)

4. HOLLARHENA, Br.

Small trees with opposite leaves and flowers in axillary cymes. Calyx-tube very short, segments linear. Corolla-tube very slender, lobes strap-shaped, overlapping to the left. Stamens inserted at the base of the tube, anthers very acute. Carpels 2, distinct, ovules numerous, when ripe very long and slender, follicular, many-seeded, seeds with a tuft of hairs at one end.

402 **H. antidysenterica**, Wall. Fl. Br. Ind. iii. 644. Bedd. Fl. Syl. clx. Gam. Man. Tim. 484. Brandis Ind. Tr. 459. Mal. *Kodaga pála.*

Leaves 4-12 in. by $1\frac{1}{2}$-5 in, ovate-oblong, glabrous or pubescent, rounded at the base, obtuse or acuminate at the apex, nerves stout, 10-14 pairs. Petiole less than $\frac{1}{4}$ in. Flowers white 1-$1\frac{1}{2}$ in. across, on slender pedicels in terminal, corymbose cymes, bracts small. Follicles 8-16 in. by $\frac{1}{4}$ in. very slender, terete, containing numerous narrow seeds $\frac{1}{2}$ in. long with a tuft silky hairs at one end,

A small tree often no more than a shrub sometimes attaining a height of 30 ft. and a diameter of 10 in. common in deciduous forests at the lower elevations. Found throughout India, and Burmah but not in Ceylon.

Flowers June-July. Fruits Feb.-March.

Gamble says that the bark is $\frac{1}{4}$ in. thick, brown, rough and exfoliating in small flakes. Wood white soft, even-grained. Pores small, numerous, in radial lines. Rays fine and very numerous, annual rings marked by faint lines, and he gives.

W = 40 lbs. P = 500.

The wood is never used in Travancore, but in other parts of India it is employed for carving, furniture, toys, plates &c. and for turning. "The bush, leaves, fruits and seeds are used medicinally, the bark as a tonic and febrifuge and in dysentery." Gamble points out that it is a great help in reclothing lands under protection from fire, as it seeds profusely and comes up readily from seed or shoots everywhere.

5. TABERNÆMONTANA, Linn.

Trees with opposite leaves and large flowers in cymes from the axils of the outermost leaves. Calyx with 2-5 glands within. Corolla salver-shaped, inflated in the middle, lobes usually overlapping to the left. Stamens inserted below the middle of the tube. Carpels distinct, ovules many. Fruit of 2 follicles, seeds many, immersed in pulp without hairs.

T. **Heyneana**, Wall; Fl. Br. Ind. iii 646; Gamble Man. Tim. 403
485; Brandis Ind. Tr. 460.

Leaves 2-12 in by $\frac{3}{4}$-4 in ovate-lanceolate, glabrous, pale green, thin, base acute, obtusely acuminate, nerves arched 10-16 pairs. Petiole $\frac{1}{4}$-$\frac{1}{2}$ in Flowers white, 1 in long and 1 in. across, fragrant, numerous in compact cymes. Follicles about 2 in. by $\frac{3}{4}$ in. sausage-shaped, orange-yellow, pulp red.

A small deciduous tree very common at the lower elevations up to 2,000 ft in open forest. Height 30 ft. Diam. 1 ft. Also found in the Western Ghauts but not in Ceylon.

Bare of leaves in March. Flowers coming out with young leaves in April. Fruits June-July.

Bark grey. Wood white and pale grey in streaks, even, smooth, moderately hard but perishable. Pores small and very small in radial lines, smaller in autumn-wood abundant. Rays fine, numerous, short, shewing a silver grain.

W=34 lbs. P=391.

The wood is not used.

6. WRIGHTIA, Br.

Trees with opposite leaves and flowers in terminal corymbose cymes. Calyx with 5-10 scales within at its base. Corolla salver-shaped with a ring of erect scales at its mouth, lobes overlapping to the left. Anthers connivent into a cone, adnate to the stigma, cells spurred downwards. Follicles 2, distinct or connate, seeds linear with a long coma at the base.

Leaves glabrous. Follicles distinct except at the apex	1. *W. tinctoria*
Leaves softly tomentose. Follicles connate throughout	2. *W. tomentosa.*

1. **W. tinctoria**, Br; Fl. Br. Ind. iii. 653; Bedd. Fl. Syl. t. 404
241; Gamble Man. Tim. 486; Brandis Ind. Tr. 461. Tam. *Nila pálei; irum palei; thontha pálei*, Mal. *Aiya pála.*

Leaves 3-7 in. by 1-2 in, oblong-lanceolate, shortly acuminate, glabrous, pale green above almost white beneath, Petiole $\frac{1}{8}$ in. flowers white $\frac{3}{4}$ in. across in lax, spreading cymes, 3 or 4 in. across. Follicles cylindrical, 6-18 in. long $\frac{1}{4}$ in. diam. cohering at the tip, seeds black thin. $\frac{2}{3}$ in. long besides the coma.

A small crooked tree with a pale, smooth bark, common in deciduous forest all through Travancore up to 2,000 ft. Height 30 ft. Diam. 1 ft. Found also in the Central Provinces and through Southern India but not in Ceylon.

Flowers March—April. Fruits Aug.—Sep.

Gamble says that the "wood is white, moderately hard. even " "grained. Pores scanty, very small, in short radial lines." "Medullary rays extremely fine, numerous." And he gives

W=49 lbs.

" The wood is of good quality for carving and turning for which "it is used........ ..Growth moderate, about 7 rings per inch of "radius." (Gamble). The leaves are used for dyeing blue in Travancore.

405 **2. W tomentosa**, Roem and Sch ; Fl. Br. Ind. iii. 653 ; Bedd. Fl Syl, clix; Trimen Fl. Cey. iii. 137 ; Gamble Man Tim. 487 ; Brandis Ind. Tr. 461. Tam. *Thonthapilei*. Mal. *Mailam pala*.

Leaves 2-5 in. by 1-2 in. ovate or obovate, acute at base, slightly acuminate, softly tomentose on both sides, venation reticulate. prominent beneath. Petiole $\frac{1}{4}$ in. Flowers yellowish-green with an orange corona, all turning dark purple, 1 in. across. Fruit of 2 carpels, connate into a cylinder 6-8 in. by 1 in. covered with warts, seeds $\frac{1}{2}$ in. coma white $1\frac{1}{2}$-2 in.

A small ornamental tree not uncommon at the lower elevations up to 1,500 ft in deciduous forest. Height 30 ft. Diam 1 ft Occurs through India, Burmah and Ceylon.

Flowers Jan.—April. Fruits June—July.

Bark $\frac{1}{3}$ in. thick, grey, corky, Wood yellowish-white mixed with irregular patches of grey, even, smooth and easy to work, moderately hard. Pores scanty, very small, often in radial lines. Annual rings marked by a pale line and occasionally more pores. Rays fine and extremely fine, very numerous.

W=34 lbs. (Gamble gives 40 lbs) P=390.

The wood is not used in Travancore, but in Bengal it is employed for turning and carved work. The bark, stem and root are administered for snake bites and the stings of scorpions. (Brandis)

ORDER LV. LOGANIACEÆ.

Trees with opposite, simple, entire leaves ; stipules interpetiolar or absent. Flowers regular, bisexual generally cymose. Calyx free, segments 4 or 5. Corolla-lobes 4 or 5, valvate, contorted or imbricate. Stamens 4 or 5 inserted in the corolla-tube Ovary superior (rarely half-inferior) 1-or 2-celled with 1 or more ovules in each cell, styles 1 or 2. Fruit fleshy, indehiscent (rarely capsular) with few or many seeds.

A small Order containing only 4 Travancore trees. Many of the plants belonging to it are bitter and highly poisonous.

Corolla valvate, seeds few ... ...1 *strychnos.*

Corolla contorted, seeds very many ... ...2. *fagræa.*

1 STRYCHNOS, Linn.

Trees with 3-or 5-nerved leaves without stipules. Calyx small. Corolla-lobes valvate. Ovary 2-celled. Fruit a globose berry, with thin pericarp, and 1-6 seeds immersed in pulp.

Cymes terminal : corolla-tube cylindrical fruit orange over 2 in. diam... 1. *S Nux-vomica*

Cymes axillary : corolla campanulate : fruit black, less than 1 in. diam. 2. *S. potatorum.*

1. **S. Nux-vomica**, Linn ; Fl. Br. Ind. iv. 90 ; Bedd Fl. Syl. t. 406
243 ; Trimen Fl. Cey iii. 175 ; Gamble Man : Tim. 497. Brandis Ind. Tr. 473. Eng : *The Nux-vomica or Strychnine tree.* Tam. and Mal. *Kanjiram.*

Leaves 2½-5 in. by 2-4. in broadly oval, shortly acuminate, obtuse, 5 nerved, glabrous and shining. Petiole ¼-½ in Flowers greenish-white, ½ in. long, glabrous within, borne on slender peduncles, numerous, in terminal cymes about 2 in. long. Berry 1½-2 in. diam. shining orange-red with a thin pericarp, containing 3 or 4 flat, shining, greyish-white circular seeds ¾ in. across, immersed in a white pulp.

A very large tree, common in the deciduous forests throughout Travancore from 0-1000 ft. Loses its leaves for a short time in the hot weather. Height 100 ft. Diam. 3 ft. Occurs throughout the greater part of India., Ceylon and Burmah.

Flowers Feb.-April. Fruits Nov.-March.

Bark blackish- grey covered with minute tubercles, 1/12 in. thick. Wood white turning to brownish-grey, smooth, close-grained and durable, but liable to crack. No heart-wood nor annual rings. Pores large and scanty, mixed with others very small and numerous running in radial lines and clusters. Rays white, very conspicuous, fairly broad, crossed by wavy bands of darker tissue.

Both this wood and the next may be easily recognised from other woods by the white streaks, about ½ an inch long, (seen on a vertical section) which represent the large pores, filled with some white substance.

W=52 P=567.

The wood is not used in Travancore except for axe-handles, but elsewhere it is employed "for plough-shares, cart- wheels, cots and fancy cabinet work." "The wood is bitter and is not eaten by white ants" (Gamble). The seeds contain the alkaloids Strychnine and Brucine, and they are collected and exported to Europe for the extraction of these substances, but the price obtained is scarcely enough to cover the cost of collection and there is little demand for them in Travancore. The London price is usually about 7-10 shillings per cwt. Strychnine in small doses is a valuable nervine tonic and in larger doses a very powerful poison. (Dict. Econ. Prod.)

2. S. potatorum, Linn; Fl Br. Ind iv. 90; Beddome F. 407
Syl. clxii ;Trimen Fl Cey iii. 176; Gamble Man. Tim. 498; Brandis Ind Tr. 474. Eng. *The Clearing nut tree.* Tam. *Thèttan kottei* Mal. *Thèttanparil kanjiram.*

Leaves 2-4 in. by $1\frac{1}{2}$-3 in. ovate or ovate-lanceolate, acute or rounded at base, tapering to apex, glabrous and shining, 3-or 5 nerved. Petiole very short. Flowers white, $\frac{1}{3}$ in. long campanulate, hairy within, borne in short axillary cymes. Berry $\frac{3}{4}$ in. diam. containing 1 or 2 pale yellow, circular, compressed, seeds, $\frac{1}{2}$ in. across, immersed in white pulp.

A tree of medium size, confined to the drier parts of the country, as Nagercoil, Shencottah, at the foot of the hills. Height 50 ft. Diam. $1\frac{1}{2}$ ft. Found also in Central and Western India, Ceylon and Burmah.

Flowers Feb.- April. Fruits Nov -March.

Bark brownish-black, corky $\frac{1}{2}$ in. thick deeply cracked. Wood yellowish-grey, hard and close-grained. No heart-wood nor annual rings. Pores some few and large, others very small and numerous, arranged in lines or patches. Rays numerous, white, fine and moderately broad. As explained under the last tree the wood is marked by white streaks from $\frac{1}{4}$ to $\frac{1}{3}$ in. long.

W = 69 lbs. (Gamble 58 lbs.) P = 840.

The wood is not used in Travancore but it is said by Beddome to be "much in use for ploughs, building-purposes, cart wheels &c'.' The seeds are not poisonous; they are very generally used for rubbing on the inside of vessels containing muddy water, which then becomes clear by the deposition of its impurities. The pulp of the fruit is an excellent emetic and a good substitute for Ipecacuanha in the treatment of dysentery and bronchitis. The seeds are used by Hindu practitioners in eye-disease. (Dict. Econ. Prod.)

2. FAGRÆA, Thumb.

Trees with glabrous, entire, opposite leaves and large flowers in terminal cymes. Petioles dilated at the base. Calyx deeply cleft, segments imbricate, enlarged in fruit. Corolla funnel-shaped, lobes much contorted. Ovary 2-celled throughout or 1-celled above. Fruit fleshy, indehiscent with very many small seeds.

Corolla-tube over 3 in. lobes less than half as long . 1. *F. zeylanica.*
Corollo-tube under 2 in. lobes more than half as long . 2. *F. obovata.*

1. **F. zeylanica**, Thunb; Fl. Br. Ind. iv. 83; Bedd. Fl. Syl. clxiv; Trimen Fl, Cey. iii. 170; Gamble Man. Tim. 495; Brandis Ind. Tr. 476. Mal. *Vallarei*; *modagam*. **408**

Leaves 5-10 in. by 3-6 in. obovate-oval, tapering to base, rounded at apex, glabrous, dark-green and shining above, paler beneath. Petiole very short. Flowers cream-coloured, 3-4 in. long in trichotomous cymes. Corolla-lobes less than half as long as the tube, recurved. Fruit 1½-2 in. ovoid, apiculate, smooth and shining, containing numerous dark-brown ovoid seeds.

A small tree generally epiphytic when young, common in the open forests through Travancore, from 0-2000 ft. Height 30 ft. Diam. 8 in. Found through the Western Peninsula and in Ceylon.

Flowers and fruits at all time.

Bark greyish-brown, rough and cracked. The wood has not been examined and it is not used for any purpose.

2. **F. obovata**, Wall; Fl. Br. Ind. iv, 83; Bedd. Fl Syl. t. 244 (under *F. coromandelina*) and clxiv; Trimen Fl. Cey. iii. 171; Gamble Man. Tim. 495; Brandis Ind. Tr. 476. Mal. *Omal*, **409**

Leaves 5-7 in. by 3-5 in. ovate or obovate, tapering to base, rounded at apex, glabrous, dark green and shining. Petiole ⅓ in. Flowers cream-colored, fragrant, under 2 in. long. Corolla-lobes more than half as long as the tube. Fruit 1-1½ in. ovoid, smooth and shining with many seeds.

A small tree generally epiphytic when young, common in evergreen forests from 2000 upwards. Height 30 ft. Diam. 8 in. Occurs throughout the Western Peninsula, in Northern India, Ceylon and Burmah.

Flowers and fruits at all times.

"Bark grey, smooth. Wood grey, soft. Pores moderate-sized" "scanty, in pairs or threes; with occasional regularly spaced very" "large pores (or intercellular ducts) filled with resinous matter." "Medullary rays fine."

"W=56 lbs" (Gamble.)

The wood is not used.

ORDER LVI, BORAGINEÆ.

Trees with alternate (rarely opposite) leaves without stipules. Flowers regular, bisexual or polygamous, in terminal corymbs or scorpioid cymes or solitary. Calyx free, persistent, segments 5-8, valvate. Corolla hypogynous, lobes 5-2 imbricate. Stamens 5-8, inserted on corolla-tube and alternating with the lobes. Ovary inferior 2-celled with 2 ovules in each cell, or 4-celled with 1 ovule. Fruit of four 1-seeded pyrenes or a drupe.

An Order of no importance containing only 4 small trees, but in temperate climates many herbs belonging to this Order are economically useful. Most of the species have rough leaves.

Flowers polygamous, style twice forked, drupe with one stone . 1. *Cordia.*
Flowers bisexual, style bifid, drupe with 2-4 pyrenes. 2. *Ehretia.*

1. CORDIA, Linn.

Trees with alternate leaves and polygamous flowers in terminal corymbs. Calyx-segments short, often unequal. Corolla funnel-shaped. Ovary 4-celled with 1 ovule in each cell, style twice forked. Drupe partly enclosed in the calyx with 4 seeds generally reduced to one.

Corolla-tube equal or shorter than calyx, stamens 5. 1. C. *Myxa.*
Corolla-tube longer than calyx, stamens 8 . 2. C. *octandra.*

410 **1. C. Myxa,** Linn: Fl. Br. Ind. iv. 136; Bedd. Fl. Syl. clxv; Trimen Fl. Cey. iii. 193; Gamble Man. Tim. 500; Brandis Ind. Tr. 478. Eng. *The Sebesten plum* Tam. *Virasu*. Mal. *Virasham*: *matha viracchi.*

Leaves 2-5 in. by $1\frac{1}{2}$-$3\frac{1}{2}$ in. broadly oval, generally obtuse at apex, tapering to base, entire or coarsely serrate in upper part, glabrous but more or less rough, basal nerves 3-5. Petiole 1-$1\frac{1}{4}$ in. slender. Flowers white, fragrant, small, 30-50 together in drooping, terminal corymbs on 1-2 in. peduncles. Drupe $\frac{1}{2}$-1 in. yellowish-brown, ovoid, apiculate, smooth, surrounded at base by the persistent calyx forming a cup.

A small tree wild in Travancore, as far as I know, only in the drier parts, but frequently cultivated for its mucilaginous fruit and ornamental appearance. Height 30 ft. Diam. 1 ft. Indigenous in the drier parts of Northern and Central India, Ceylon and Burmah, and cultivated everywhere.

Bare of leaves Jan.-Feb. Flowers and fruits Feb.-May.

Gamble says that the bark is $\frac{1}{2}$-$\frac{3}{4}$ in. thick, grey or brown, rough with shallow furrows. Wood greyish-brown, moderately hard. Pores moderate-sized to large, scanty, joined by concentric bands of tissue. Rays short, moderately broad, shallow, showing a mottled silver-grain on a vertical section. Growth 3-9 rings per inch. and he gives.

W=33 lbs.

"The wood in spite of its softness is fairly strong and seasons" "well, but is readily attacked by insects. It is used for boat-build-" "ing, well-curbs, gun-stocks and agricultural implements (Brandis)" "in Bengal for canoes. It is an excellent fuel. The bark is made," "into ropes and the fibre is used for caulking boats" (Gamble). The fruit is eaten; it is very mucilaginous, and is used in native medicine and as a bird-lime. In Travancore the mucilage of the fruit is used for fastening letters, but the wood is not employed for any purpose.

2. C. octandra, A. DC; Fl. Br. Ind. iv. 140; Bedd Fl. Syl. clxvi; Gamble Man. Tim. 502; Brandis Ind. Tr. 480. Tam. *Potta virasu.*

Leaves 2-6 in by $1\frac{1}{2}$-4 in. alternate, ovate, acuminate or rounded, more or less serrate, nearly glabrous, 3,5, nerved. Petiole $\frac{3}{4}$-$1\frac{1}{2}$ in. long, pubescent. Flowers white, $\frac{1}{3}$ in. across, 6-10 together in long-peduncled terminal corymbs. Stamens 8, alternately long and short, filaments hairy. Fruit not seen.

A small tree common in the forests about Ariankavu and Puliyera at 1000 ft. not seen elsewhere. Height 20 ft. Diam 8 in. Endemic.

Flowers in September.

Bark pale brown, stringy, $\frac{1}{3}$ in. thick. Wood whitish-brown, darker in centre, soft. Pores very small and scanty in narrow belts of pale tissue. Rays of 2 kinds, some broad, some fine.

W=21 lbs. P=448.

The wood is used for agricultural implements.

2. EHRETIA, Linn.

Trees with alternate or fascicled leaves, and small bisexual flowers in corymbs, or solitary. Calyx small, segments 5, persistent in fruit but not accrescent. Corolla-lobes 5, spreading, imbricate. Stamens 5. Ovary 2-celled with 2 ovules in each cell. Drupe of four 1-seeded pyrenes.

Leaves over 3 in. long, acuminate . . 1. *E. lævis.*
Leaves under $2\frac{1}{2}$ in long, obtuse . . 2. *E. ovalifolia.*

1. E. lævis, Roxb ; Fl. Br. Ind. iv. 141 ; Bedd. Fl. Syl. t. 246 ; Trimen Fl. Cey. iii. 195 ; Gamble Man. Tim. 503 ; Brandis Ind. Tr. 481 Mal. *Chavandi* 412

Leaves 3-6 in by 1-3 in. entire, ovate, acuminate, tapering to base, pale beneath with 5 6 pair of prominent veins. Petiole $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers white, fragrant, $\frac{1}{8}$ in across. 20-40 together on short pedicels in terminal, spreading corymbs. Calyx pubescent. Style simple, shortly bifid. Drupe globose, bright scarlet, $\frac{1}{4}$ in long, containing 4 pyrenes.

A small tree common in evergreen forests at moderate elevations through Travancore. Height 30 ft. Diam. 1 ft. Found throughout India.

Flowers and fruits in September.

" Bark $\frac{1}{3}$ in. thick, grey. Wood greyish or brownish-white, moderately hard, even-grained. Annual rings indistinctly marked. Pores small, grouped in small clusters or radial lines. Medullary rays fine, short, numerous, distinctly visible on a radial section."

W.=33 lbs.

"The tree coppices easily and reproduces well but is of little "
" value Growth moderate 5-8 rings per inch of radius. The wood "
" is tough and durable, and is used for agricultural implements and"
" in building. The fruit is eaten, as is also the inner bark in times"
" of famine." (Gamble). Not used in any way in Travancore.

413 **2. E. ovalifolia,** Wight; Fl. Br. Ind. iv. 143; Bedd. Fl. Syl, clxvii, Gamble Man. Tim. 503; Brandis Ind. Tr. 481.

Leaves 1½-2 in. by 1 in. oval or obovate, obtuse, smooth on both sides, sometimes hairy on the under side. Petiole ⅛ in. Flowers in short pedicels. Drupe red, the size of a pea.

A small tree very similar to the last, except for its obtuse leaves. found by Lawson in S. Travancore, not seen by me. Occurs also in Coimbatore, Madura and Tinnevelly up to 2000 ft.

The weight and uses of the wood are not known.

ORDER LVII. BIGNONIACEÆ.

Trees with opposite, compound, exstipulate leaves. Flowers bisexual, irregular, interminal racemes or panicles. Calyx free, with 5 segments, or irregularly split. Corolla campanulate or tubular, with 5 nearly equal lobes, but the upper 2 often connate into a lip. Stamens usually 4, didynamous (sometime 5). Ovary superior, 2-celled with numerous ovules- Fruit a 2-valved capsule containing numerous winged seeds.

This Order contains only 6 trees indigenous in Travancore, but many climbers and shrubs from different countries belonging to it are cultivated in gardens, here and in Europe, for their handsome flowers.

Leaves pinnate or bipinnate, stamens 4.
Calyx spathaceous, split on one side, calyx lobed or truncate. 1. *Dolichandrone.*
Capsule not winged septum cylindrical . 2. *Stereospermum.*
Capsule winged, septum flat . 3. *Pajanelia.*
Leaves bi-or tripinuate, stamens 5 . 4. *Oroxylum.*

1. DOLICHANDRONE, Seem

Trees with opposite, odd-pinnate leaves. Flowers large, in few-flowered racemes or panicles. Calyx spathaceous, cleft to the base Corolla-tube inflated above. Stamens 4, didynamous. Ovary sessile. Capsule more or less compressed, seeds many with corky wings.

414 **D. Rheedii,** Seem. Fl. Br. Ind. iv. 379, Bedd. Fl. Syl. clxviii (under *Spathodea Rheedii*); Trimen Fl. Cey. iii. 282; Gamble Man. Tim. 512; Brandis Ind. Tr. 494.

Leaf-rachis 9-12 in. with 5-9 leaflets each 3-6 in. by 1-3 in. ovate-lanceolate, acuminate, often unequal entire, glabrous and shining. Flowers white, 3 or 4 together on short erect peduncles. Calyx in bud curved, 2 in. long, completely closed. Corolla 6 in. with much crisped lobes, 3 in. across. Capsule 18 in. smooth, purplish-brown, seeds rectangular flat, white 5/8 in across.

A small tree 40 ft. high growing on the banks of rivers in N. Travancore. Found also in Bengal, Ceylon and Burmah.

Flowers March-May. Fruits July-Sept.

Gamble says that the wood is "white, soft. Pores small, often" "subdivided, in wavy narrow, concentric bands. Medullary rays" "very fine, very numerous, prominent on a vertical section." and he gives,

W.=35 lbs.

The wood is not used.

2. STEREOSPERMUM, Cham,

Trees with pinnate or bipinnte leaves, and flowers in terminal panicles. Calyx campanulate with 5 short segments. Corolla-tube campanulate, lobes crisped at margin. Stamens 4, didynamous with a very short staminode. Capsule linear with 2 sharp edges, not winged, septum cylindrical, seeds numerous with a long wing at each end.

Leaves odd-pinnate. Flowers yellow or crimson.
- Young leaflets and panicles glabrous. Flowers yellow. Capsule smooth, curved . 1. *S. chelonoides.*
- Young leaflets and panicles hairy. Flowers crimson. Caspule warted, straight . 2. *S. suaveolens.*

Leaves bi-pinnate. Flowers white . 3. *S. xylocarpum.*

1. **S. chelonoides,** DC; Fl. Br. Ind. iv. 382. Bedd. Fl. Syl. t. 72; Trimen Fl. Cey. iii. 283; Gamble Man, Tim. 514; Brandis Ind. Tr. 495. Tam. *Pombáthiri.* Mal. *Karingkura.* 415

Leaf-rachis 6-8 in. with 5-11 leaflets, each 4-6 in. by 2-3 in oval, caudate, very acute, entire, glabrous, purple when young, finely reticulated. Petiolules $\frac{1}{3}$ to $\frac{1}{2}$ in. Flowers yellow, veined with red. $\frac{3}{4}$ in. long, in lax drooping panicles. Capsule 1-2 ft. long by $\frac{1}{2}$ in. wide, smooth, curved. Seeds wedge-shaped $1\frac{1}{4}$ in.

A very large tree, common in all deciduous forests from 0-4000 ft. Height 100 ft. Diam. 3 ft. Found through India, Ceylon and Burmah.

Flowers April-June. Fruits Nov.-Dec.

Bark pale brown and uneven, $\frac{1}{2}$ in. thick. Wood greyish-brown with patches of brighter brown, coarse and hard, no heartwood. Pores medium-sized and large, numerous, connected by wavy bands of softer tissue, often filled with a resinous white substance. Rays short, moderately broad, white and numerous. No annual rings.

W.=42 lbs. P.=772.

Though this is a fine tree which would yield a large quantity of timber, it is never used in Travancore. Gamble says, "The wood is moderately durable, elastic, easy to work; it is used for building and is good for furniture. It is used for canoes and building" in Assam, and for tea-boxes in Cachar. The roots, leaves and flowers are used medicinally, and the flowers in Hindu temples. (Dict. Econ. Prod.)

2. **S. suaveolens** DC; Fl. Br. Ind. iv. 382; Bedd. Fl. Syl. clxix; Trimen Fl. Cey. iii. 284; Gamble Man. Tim. 515; Brandis Ind. Tr. 495. Tam. *Pathiri.* 416

Leaf-rachis 12-18 in. with 5-9 leaflets, the end leaflet 6 in. by 3-4 in. the others smaller, oval, acuminate, often serrate, downy on both sides when young, at length glabrous. Petiolules ½ in. or more. Flowers dull crimson, very fragrant, 1⅝ in. long in viscid panicles. Capsule straight, cylindrical, dark grey and covered with tubercles, 18-24 in. by ¾ in.

A deciduous tree of medium size found in company with the last named but much rarer. Height 60 ft. Diam. 1½ ft. Found through India and Burmah but absent from Ceylon.

Flowers in April-June. Fruits Nov.—Dec.

Gamble says that the bark is gray, ¼ in. thick and exfoliates in large scales. Wood hard ; sapwood grey ; heartwood small, yellowish brown, beautifully mottled with darker streaks, very hard, seasons and polishes well. Pores moderate-sized, enclosed in patches of light tissue and often filled with a white substance. Rays fine, sharply defined and numerous, and he gives.

W. = 46 lbs.

The wood is not used in Travancore, but it is durable, easy to work, good for building and makes excellent charcoal (Gamble). The bark under the name of "Palol" is a favourite tonic medicine. The root, leaves and flowers are used in native medicine. (Dict. Econ. Prod.)

417 3. **S. xylocarpum,** Wight ; Fl. Br. Ind. iv. 383 ; Bedd. Fl. Syl. t. 70 (under *Bignonia xylocarpa*) ; Gamble Man. Tim. 516 ; Brandis Ind. Tr. 495 Tam. *Pathiri* Mal. *Vedangkonnan*, *edangkorna*.

Leaves bipinnate, 1-4 ft. long with 4½ pair pinnæ, each with 3-9 leaflets. Each leaflet 2-3 in. by ¾-1½ in. lanceolate, acute, entire, glabrous, subsessile. Flowers white tinged with yellow, 1½-2 in. long, fragrant, borne in dense pubescent panicles. Capsule 12-30 in. by 1-1½ in, slightly curved, covered with irregular hard tubercles. Seeds discoid, including the wings 1¼ in. by ¼ in

A medium-sized tree of the deciduous forest common through Travancore from sea level to 4000 ft. but nowhere abundant. Height 60 ft. Diam. 1½ ft. Found also in Bombay and Central India and through the Madras Presidency, but absent from Ceylon and Burmah.

Flowers March to May. Fruit Nov.-Jan.

Bark 1 in. thick, pale brown rough. Sawood white, thick. Heartwood very hard, reddish-brown, smooth, straight grained and even. Pores medium-sized to very small, each pore or group of pores in a patch of soft tissue, which often forms bands more or less concentric. Rays fine, distinct, oftern wavy. Annual rings marked by a belt of more numerous and larger pores about 9 to inch.

W. = 42 lbs P. = 785.

The wood is highly valued in some places, but the demand for it is irregular, and owing to the comparatively small size of the tree and its thin distribution about the country it is seldom felled. It makes excellent tables and other furniture, and it is sometimes used

for carriage shafts. The wood contains a resin which is extracted by the natives of Western India, It is used as a remedy for skin-eruptions (Dict. Econ. Prod.)

3. PAJANELIA, DC.

Trees with opposite, odd-pinnate leaves, and numerous entire leaflets. Flowers large in erect, terminal panicles. Calyx ovoid, closed in bud in flower campanulate 5 fid. Corolla tubular with 5 crisped lobes. Stamens 4 with a staminode Capsule winged, compressed, narrowly oblong with a flat septum ; seeds winged on each side.

P. Rheedii, DC ; Fl. Br. Ind. iv. 384 ; Bedd. Fl. Syl. clxix ; Gamble Man. Tim. 517 ; Brandis Ind. Tr. 494. Tam. *Aránthal.* Mal. *Arlántha* ; *p. iyáni.* 418

Leaf-rachis 2-4 ft. long with 12-14 pair opposite leaflets and an odd one, each 4-10 in. by 2-4 in. ovate, acuminate. unequal-sided, glabrous. veins prominent. Petiolules very short. Flowers crimson-purple, white inside, about 4 in long Capsule brown, smooth, 12-18 in. long and 2-3 in. wide, including the broad wing on either edge Seeds flat, white, 1 in by ½ in.

A deciduous tree of medium size bare of leaves during the hot months, much planted in gardens as a support for pepper where it seldom grows to a height of more than 40 ft but in the forest it attains a height of 80 ft and a diameter of 2 ft Rather rare. Occurs also on the Malabar coast, in Eastern Bengal and Burmah but absent from Ceylon.

Flowers Feb.-April Fruits Nov.-Feb.

Bark pale grey and shining, rough ⅓ in thick. Gamble says that the wood is orange-brown, very hard close-grained. Pores lare, sometimes filled with yellow resin. each pore surrounded by a ring of light tissue. Rays fine, very numerous, prominent and uniform, and he gives.

W. = 52 lbs.

The tree is sometimes used for dug-out canoes in Travancore but being rare, it is not often felled. Its chief use is as a support to the pepper vine for which purpose it appears to be better suited than any other tree, as its rough bark affords a good foot-hold to the vine, and just when the fruit is ripening the tree is bare of leaves.

4. OROXYLUM, Vent.

Trees with large, opposite, 2-3 pinnate leaves. Flowers in large terminal racemes. Calyx truncate or obscurely toothed. persistent. Corolla campanulate. 2-lipped. lobes 5, upper pair partially connate. Stamens 5. all fertile, filaments unequal. Capsule very large, strongly compressed, seeds flattened with a broad transparent wing.

O. indicum, Vent ; Fl. Br. Ind. iv. 378 ; Bedd. Fl. Syl, clxviii (under *Bignonia indica*) ; Trimen Fl. Cey. iii. 281 ; Gamble Man. Tim. 510 ; Brandis Ind. Tr. 496. Tam. *Pei.-arlánthei* Mal. *Palaga paiyáni* 419

Leaves 3-5 ft. long, triangular in outline, primary pinnæ numerous, pinnules 3-5 foliolate, leaflets ovate, entire, acuminate, glabrous, unequal, 3-6 in. by 2-2½ in. Raceme 2-3 ft. long. Flowers 2½-3 in. pinkish yellow inside, reddish purple outside, fetid. Capsule 2-2½ ft. long by 3-4 in. wide, tapering to both ends. Seeds rectangular 3 in. by 1½ in. very flat and thin.

A thin winged all round foliaged ungainly tree scattered all through the evergreen Forests of Travancore, between sea-level and 2000 ft. Height 30 ft. Diam. 10 in. Occurs also in Southern India, Bengal, Ceylon and the Malay Archipelago.

Flowers April to June. Fruits Oct-Jan.

Gamble says that the bark is ¼ in. thick, light brownish-grey and soft. Wood yellowish-white, soft, no heartwood. Pores scanty, moderate-sized and uniformly distributed. Annual rings marked by more numerous pores. Rays fine to moderately broad, and he gives

W = 30 lbs.

"The bark and fruit are used in tanning and dyeing and the" "seeds, which are very thin with broad papery wings, are used to" "line hats" (Gamble). Trimen says that the bark is much used as an astringent tonic.

Closely allied to this is *Millingtonia hortensis* Linn, the "Indian Cork tree," much cultivated in gardens for ornament, but it has an unpleasant habit of sending up suckers from its roots in great quantities, far from the parent tree. It will not stand wind. A native of Burmah.

ORDER LVIII. VERBENACEÆ.

Trees with opposite or whorled, simple or compound leaves. Flowers bisexual, regular or irregular, in heads, spikes or cymes. Calyx with 4 or 5 segments or 2 lipped persistent. Corolla-lobes 4 or 5, subequal, imbricate or in 2 lips. Stamens usually 4, didynamous (sometimes 5 or 6 and equal). Ovary 2-celled with 2 ovules in each cell, or 4 celled with one ovule. Fruit drupaceous or capsular with 1-2 or 4 pyrenes, or solitary.

This Order contains the Teak and 10 other trees indigenous in Travancore, several of which yield valuable timber. Many plants and herbs belonging to it are cultivated for their beauty or for their perfume.

Flowers numerous; fruit drupaceous, seeds 4.

Leaves digitate	1.	*Vitex.*
Leaves simple		
Calyx much enlarged in fruit		
Calyx globose, enclosing the fruit	2.	*Tectona.*
Calyx deeply divided, campanulate	3.	*Clerodendron.*
Calyx not enlarged in fruit.		
Corolla large, exceeding 1 in.	4.	*Gmelina.*
Corolla small, less than 1 in.		
Corolla 2-lipped, endocarp 1-4 celled.	5.	*Premna.*
Corolla 4-lobed, pyrenes 4, 1-seeded	6.	*Callicarpa.*
Flowers few, fruit capsular, seed solitary.	7.	*Avicennia.*

1. VITEX, Linn.

Trees with digitately 3-or 5-foliolate leaves. Flowers in small cymes combined into terminal panicles. Calyx campanulate with 5 very short segments. Corolla-tube short, lobes 5, the lowest much the largest and forming a lower lip. Stamens 4, didynamous. Ovary 2-4-celled, ovules 4. Drupe supported at base by the slightly encarged calyx, usually containing 4 seeds.

Inflorescence terminal.
Branches terete; leaves glabrous beneath, petoile often winged . 1. *V. altissima.*
Branches quadrangular, leaves pubescent beneath, petiole not winged.
Leaflets white beneath, lanceolate . 2. *V. negundo.*
Leaflets green or tawny beneath, ovate . 3 *V. pubescens.*
Inflorescence axillary . 4. *V leucoxylo*

1. V. **altissima**, Linn. Fl. Br. Ind. iv. 584, Bedd. Fl. Syl t. 252; Trimen Fl. Cey. iii. 357; Gamble Man Tim. 540; Brandis Ind. Tr. 504. Tam. *Mayilei.* Mal. *Mayila: mayileu.* 420

Leaves 3-foliolate, occasionally with 2 more leaflets, each 2½-6 in. be 1-2½ in. lanceolate, acuminate, entire, tapering to base, glabrous on both sides except on the midrib beneath. Common petiole 2½ in. often winged. Flowers pale violet ⅓ in. long, borne in terminal panicles in great abundance. Drupe ⅓ in purplish-black, smooth, globose.

A very large and lofty tree of the deciduous and open dry forest, abundant through Travancore from sea level to 4000 ft. Height 90 ft. Diam. 4 ft. Found through Western and Southern India and in Ceylon.

Flowers from April—Aug. Fruits June—Sep.

Bark greyish-brown, rough, ⅓ in. thick. No regular heartwood but the centre darker. Wood yellowish-brown with a tinge of grey, hard, smooth, close grained and polishes well, but is liable to split. Pores small, scanty, more numerous in the spring wood. Rays fine numerous and equidistant. Annual rings marked by darker and denser autumn wood 4 or 5 to inch.

W=60 lbs. P=784.

An excellent wood suitable for furniture, building, the construction of carts and other purposes, and priced accordingly, but it is not much in demand, possibly because of its weight and tendency to split. Present price 12 annas per cub. ft. in log.

2. V. **Negundo**, Linn; Fl. Br. Ind. iv. 583: Bedd. Fl. Syl. clxxi; Trimen Fl. Cey. iii. 357: Gamble Man. Tim 539: Brandis Ind. Tr. 503. Tam. and Mal. *Nocchi.* 421

Leaves 3-or 5-foliolate, rachis quadrangular, leaflets 2-4 in. by 1½-1 in. linear-lanceolate, acuminate, entire pale green above, pubescent and white beneath. Petoile ⅓ in. Common petiole not winged, 1-3 in. Flowers ⅓ in. lilac-blue in short cymes or erect terminal panicles 6 in. long. Drupe black, nearly globose, ¼ in. diam.

A small tree, often only a shrub, common in waste places at low elevations especially in the drier parts of the country. Height 20 ft. Diam. 8 in. Common throughout India and in Ceylon.

Flowers and fruits all the year round.

Gamble says that the bark is thin and grey. Wood greyish-white, hard. Pores small and moderate-sized, scanty. Rays numerous, fine and uniform. Annual rings marked by a belt of numerous pores 7 to inch and he gives.

W=41 lbs.

"The branches are used for wattle-work, hedges and making" "rough baskets, the root is employed as a febrifuge, and the leaves," 'root and fruit in native medicine" Gamble). The ashes are largely used as an alkali in dyeing (Dict. Econ. Prod.)

422 3. **V. pubescens,** Vahl; Fl Br. Ind. iv. 585; Bedd. Fl. Syl. clxxi; Gamble Man. Tim. 541: Brandis Ind. Tr. 504. Mal. *Atta mayila.*

Leaves 3-or 5-foliolate, rachis quadrangular, leaflets 4 to 9 in. by 2-4 in. sessile, ovate or oblong, entire, accuminate. dark green above, covered with green or tawny pubescence beneath. Common petiole 2-4 in not winged. Flowers lavender or pale purple $\frac{1}{3}$ in. long in dense, pubescent, terminal panicles 3-5 in. across. Drupe black, shining, $\frac{1}{3}$ in. diam.

A tree of medium size common in the low country especially along the banks of streams, and often planted on road sides. Height 40 ft. Diam. 15 in. Occurs through Southern India. Bengal and Burmah, but absent from Ceylon.

Flowers and fruits from Jan-June.

Gamble says that the "wood is smooth, reddish-brown or olive" "brown, very hard, close-grained. Annual rings marked by a more" "or less sharp line, and by a broad belt of firmer wood on the outer" "edge. Pores small to moderate-sized, scanty, uniformly distri-" "buted. Medullary rays fine and very fine, numerous, equidistant," and he gives.

W=54 lbs.

The wood appears to be excellent, but it is not used in Travancore. "It is durable, and is used for various purposes in S. India; the Burmans employ it to make wooden bells". (Dict. Econ. Prod.)

423 4. **V. leucoxylon,** Linn; Fl. Br. Ind. iv. 587: Bedd. Fl Syl. clxxi: Trimen Fl. Cey. iii. 358; Gamble Man. Tim. 542: Brandis Ind. Tr. 504. Tam. *Nir nochi.* Mal *Atta nochi.*

Leaves 3-or 5-foliolate: rachis terete, slender, leaflets 3-5 in. by 1-1$\frac{1}{2}$ in. lanceolate: acuminate, entire, glabrous on both sides except on the midrib beneath, dark green above, pale beneath. Common petiole 2 in. not winged. Flowers white tinged with purple, $\frac{1}{2}$ in. long, in loose axillary cymes on long pedicels. Drupe ovoid $\frac{3}{4}$ in. long, dark purple, smooth and shining.

A small tree often seen on river sides in the low country but never plentiful. Height 30 ft. Diam. 10 in. Also found through Southern India and in Ceylon.

Flowers Feb.-March. Fruit ripens in June.

Gamble says that the "bark is grey and smooth. Wood light" "greyish brown, moderately hard. Pores moderate-sized, often" "subdivided, evenly distributed. Medullary rays moderately broad," "regular" and he gives.

W=42 lbs.

The wood seems to be good but it is not used in Travancore, possibly because the tree does not attain a large size. In the Madras Presidency and Ceylon it is in good demand. The bark and root are used as astringents in the Andaman Islands (Dict. Econ. Prod.)

2. TECTONA, Linn.

Trees with quadrangular branchlets and large opposite, entire, simple leaves, all parts clothed with stellate pubescence when young. Flowers in large terminal panicles. Calyx campanulate, segments 5 or 6, imbricate, enlarged in fruit. Corolla-tube short. lobes 5 or 6, spreading, subequal. Stamens 5 or 6. Ovary 4-celled with one ovule in each cell. Fruit a nut enclosed in a spongy covering which is surrounded by the inflated calyx.

T. grandis, Linn.; Fl. Br Ind. iv. 570; Bedd. Fl. Syl. t. 250; 424
Gamble Man. Tim. 526; Brandis Ind. Tr. 505, Eng. *The Teak tree*, Tam. and Mal. *Thekku*.

Leaves 1-2 ft. by 6-12 in. oval or obovate, obtuse, glabrous but rough above, clothed with dense white tomentum beneath, lateral veins prominent. Petiole 1-1½ in. Flowers white ⅓ in. long, borne in erect, terminal panicles 1-2 ft. tall. Nut with the spongy covering ⅓ in diam., enclosed in the pale green inflated calyx, forming a loose bag 1 to 1½ in. diam. Seeds 1-3 rarely 4.

A very large deciduous tree sometimes attaining a height of 150 ft. and a diameter of 8 ft. It is common in deciduous forest from sea-level to 3000 ft. in suitable localities throughout the State. South of the latitude of Quilon, where the rainfall does not amount to 100 inches, teak does not attain a large size and it is altogether absent from much of the deciduous forest north-east of Trivandrum. In the very dry climate of the extreme South it seldom exceeds 1 ft. in diameter and 30 ft. in height. It is then known as "kol-teak" and is often found growing in pure groves to the exclusion of every other tree. North of Quilon, where the rainfall exceeds 100 inches, as far as the Northern frontier, this tree attains its largest dimensions on the lower slopes of the hills. The teak tree is indigenous all up the West Coast, on the Annamallaye, in Central India and Burmah as far north as 25° N. Lat. But it is absent from Ceylon. It is also found in Java, Sumatra and some islands of the Indian Archipelago.

Teak loses its leaves according to season and locality between the end of November and the middle of January, and it remains leafless till the first showers in March. The new foliage is then very

quickly put on. The flowers appear between June and August and the fruit ripens from Nov. to Jan.

The bark is ⅓ in. thick, pale brown with shallow longitudinal cracks, rather rough. Sapwood white usually small. Heartwood pale brown or dark golden yellow, darkening with age, moderately hard but rather coarse, strongly scented with a fragrant wood-oil. Pores large to small, the larger running in concentric circles and making the spring-wood, the smaller decreasing in size through the summer and autumn-wood. Rays moderately broad and fairly numerous, plainly seen on a vertical section. Annual rings marked by rows of large pores at varying distances.

The weight and strength of teak wood have been tested by many persons and the figures given differ widely. When fresh cut, this wood will hardly float, but after seasoning it does so easily. The larger logs take from 2-3 years to dry, while for the smaller a year will generally suffice. Gamble gives figures showing variations between 55 lbs. and 31·5 lbs. per cub. ft. and between 953 and 468 for the value of P for seasoned wood, but his general figures are

W=45 lbs. P=600.

As pointed out by Brandis, "the Teak tree thrives with a mean" "temperature during the cold season of between 60° and 80°, dur-" "ing the hot season between 80° and 85°, during the rains between" "77° and 87°, during autumn between 71° and 81° while the mean" "annual temperature which suits it best lies between 72° and 81°."

The mean annual rainfall should, as I have shown, exceed 100 inches, but Teak will grow where the fall is very much less. The soils best suited to it are a rich, red, sandy clay mixed with stones, or a dark alluvial sand, but Teak will not grow well if the drainage is bad, as on stiff laterite. If flooded for many days at a time the trees will sicken and die. Teak is a light-demanding tree, and cannot grow in close proximity with other trees, nor can it bear to be overtopped or crowded by them. Hence its absence from the evergreen forests. It is generally found in company with *Dalbergia latifolia, Pterocarpus marsupium, Schleichera trijuga, Xylia dolabriformis, Terminalia tomentosa and T. belerica, Càssia fistula, Gmelina arborea, Bridelia retusa, stephegyne parviflora* and others. In Travancore it is not generally found growing with bamboos alone, but in the Idiyera Valley it attains a large size with an undergrowth of pure eeta (*Ochlandra travancorica*).

In the forest the Teak tree is subject to the ravages of forest fires, and the youg seedling is often burnt down for several years in succession before it can raise its head high enough to escape them. Even then, and on throughout the whole of the life of the tree, its stem is liable to be burnt, whereby its timber is much damaged, but the tree itself manages to survive. It is now generally admitted that the concentric rings so characteristic of the wood of this tree exactly indicate the age, one ring representing each year. Gamble quotes figures to show that the average rate of growth in the forest only is 12·2 rings per inch, equivalent to an increase in diameter of 1 inch in six years,

Aruvithalai Plantation: 9 years old (in 1908).

and he calculates that the average girth at different ages as is follows: —

at	68 years	...	3 ft.
at	97 years	...	$4\frac{1}{2}$ ft.
at	132 years	...	6 ft.
at	159 years	...	7 ft.

In plantations the growth is much more rapid, and Gamble states that under favourable circumstances, 2 01 rings per inch are added each year. According to P. M, Lushington (Nilambur Working Plan) the average annual growth increment on the Nilambur plantations is 1·42 inches at 18 years and 8·8 of an inch at 47 years-equivalent to from 4 to 8 rings per inch. In vertical growth the Teak shoots up from 10 to 15 ft. or even more in the first year, and 6 ft. a year for some years upwards. By the 30th year it has attained a height of 80 ft. with a clean bole of 60 ft. and its diameter at breast height is 10 inches. After that the growth in height is slow, but the girth steadily increases. At 50 years it should be 14 in. diam. at 70 years 19 in. and at 90 years 24 in.

Teak grows to an immense size. I have myself measured a tree in the Achencoil valley 26 ft. in circumference. but it had a short bole. At the beginning of last century, when the British Naval Department were collecting teak in Travancore a tree was felled in the Idiyera valley, which measured seven ft in diameter at its butt and 26 inches at a length of 70 ft. It therefore contained 900 cubic ft. of timber. Greater measurements have been recorded elsewhere. Such huge trees must be many thousands of years old.

Plantations of Teak were first commenced in Travancore in 1042=1866-7A D. and they have been gradually extended since then. At present there are 2666 acres at Konni, Malayattur and Arienkavu of the following ages: —

From 30-40 years	230 acres.
From 20-30 years	400 acres.
From 10-20 years	650 acres.
Under 10 years	1386 acres.
Total...	2666 acres.

Provided that labour is plentiful the forming of plantations is a very simple matter. The chief difficulty consists in keeping down the weeds for 2 years after planting. If this is not carefully attended to the young teak trees are killed out. For the first few years the distance of planting between the trees was 15 ft by 15 ft. each way. At present it is 5 ft. × 5 ft or 6 ft. × 6 ft. Thinnings commence at the 7th year and are repeated in the 9th, 12th 16th, 20th and every 5th year afterwards. The final fellings are expected to be made in 90th year. From actual measurements of sample plots it has been calculated that charging 4 per cent, interest the sale of thinnings will pay off all expenditure by the 70th year, and that at the time of final felling in the 90th year, there will be a balance to the profit of 6887 Rs. per acre or at the rate of 76·6 Rs. per acre each year from the commencement.

It has often been suggested that Teak should not be grown alone, but that it should be associated with some other tree, and several kinds of trees have been suggested. Experiments on a small scale, by undersowing with the Anjili (*Artocarpus hirsuta*) have been very successful, as this tree is a shade-endurer, and grows rapidly. Further experiments with this tree on an extended scale are now being carried out.

There are vast areas of Forest land in Travancore which were cleared for hill-cultivation in former years and are now covered with a pure growth of the eeta (*Ochlandra travacorica*). This would do admirably for growing teak but the problem is how to plant them up rapidly. The "Taungya" system followed in Burmah, by which cultivators are allowed to clear the land and take one or two crops of grain off it, provided they plant and deliver over at the end of a year a certain number of teak trees per acre has been tried here, but has not been a success. It is proposed to give the system another trial under different conditions.

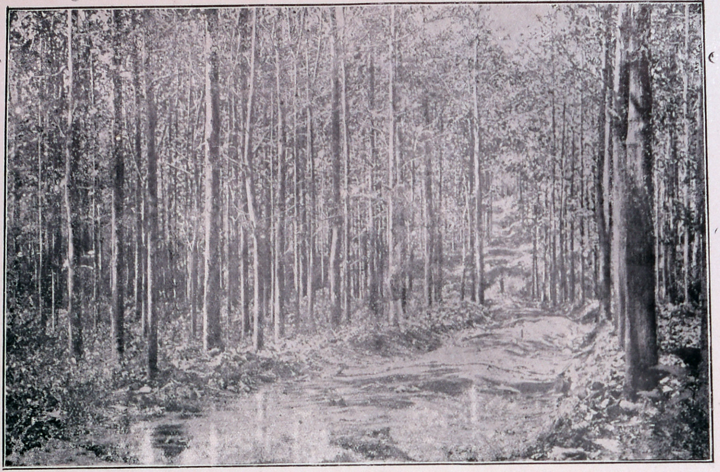
Teak, especially when grown in plantations, is liable to the attacks of insects and to damage from other causes. When the trees are from 1 to 2 years old and the wood is soft the caterpillar of a moth (*Coscus cadambœ*) bores a hole into the stem, generally within a foot of the ground and then tunnels downwards. The only remedy is to cut the tree down and let it throw up a new shoot below the wound. As the wood hardens with age, it becomes no longer liable to the attacks of this borer, but should the mature tree be lopped of its branches, a custom which used to be very prevalent in compounds in N. Travancore, for the purpose of cultivating ground crops under the Teak, the wood again softens and is readily tunnelled by the same borer.

Another insect that does immense damage is the caterpillar of *Hyblœa puera.* It attacks the young leaves of the Teak tree as soon as they are fully devoloped in April each year and completely defoliates the tree in 2 or 3 weeks. If the monsoon is delayed, a second crop of leaves may be destroyed in the same way, otherwise the insect disappears for a year. Sometimes if the weather is favourable to them these caterpillars may appear in September and defoliate the trees, but as a rule they do not do so. Such defoliation entirely checks the growth of the tree till the leaves are renewed, and no remedy has been discovered which will prevent these attacks.

Elephants do a great deal of damage by breaking down young trees up to 10 years old, in order to taste the bark, though they do not eat it, and much loss is caused by windstorms which snap off the finest trees especially just after the thinning of a plantation.

The uses of Teak are innumerable, for there is hardly any purpose for which timber is employed to which it cannot be put. As remarked by Brandis, one of the most valuable qualities of the wood is that once seasoned it does not split, crack, shrink, warp or alter its shape. It works easily and takes a good polish and is of handsome appearance. But its principal value is its great durability, which is due to the essential oil it contains, which prevents white ants from

Naduvathumuzhi Plantation 27 years old (in 1908).



Victoria Plantation 16 years old (in 1908).

attacking the heartwood and preserves it from the effects of weather. Another great advantage in the use of teak is that it is abundant in places where it is indigenous, and the supply of it as steady and of equal quality. But it is a mistake to suppose that teak is a strong wood, capable of bearing a great strain. In this respect Blackwood and many other timbers surpass it, and it should not therefore be used for engineering works, bridges and houses where it must bear a heavy weight, but for the other parts of houses, for doors and windows and for furniture it is unsurpassed. It is more largely used than any other wood for ship-building.

The comparative value of fast-and slow-grown teak has been much discussed, the general impression being that the latter is superior, but this is not the case with oak, it having been conclusively proved that fast-grown oak is superior to the slow-grown timber of that species. In 1880 experiments were carried out on the Nilambur Plantations which showed that plantation-teak was denser than that grown in the natural forests. The matter requires further investigation, but whatever may be the final decision, both classes of timber have their uses, the denser and heavier wood being superior for building, and the lighter being preferable for furniture.

Teak is a royal tree. Wherever it is found growing it belongs to the Government, and may not be felled without permission, but, for the last 14 years, one-fourth of the value of the timber has always been paid to the owners of land where it is found growing, to encourage them to protect it. At the beginning of the last century very large indents were made on the Travancore forests for timber of good size for the Bombay Dock-yard. It is not therefore surprising to find that 1st class timber is now very difficult to procure, and is only to be found in inaccessible and isolated localities in the interior, but there is a large supply of 2nd and 3rd class teak in the country, and the sales of teak largely exceed those of any other tree. The annual output averages about 25,000 candies (400,000 cub. ft.) worth 3 laks of rupees. The selling price for teak in log is for:

1st class (above 15 in. quarter-girth) per cubic foot		Rs. 1-3 as.
2nd class (from 13 to $14\frac{3}{4}$ in. quarter-girth)	...	13 as.
3rd class (below 10 in. quarter-girth)	...	10 as.

The oil is used medicinally, as a substitute for linseed oil and as a varnish (Kurz), but it would seem that its extraction as an oil is difficult, while as a tar it is comparatively easy (Gamble). The leaves are used as plates, for wrapping parcels and for thatching rough sheds. They contain a red dye.

3. CLERODENDRON, Linn.

Trees with simple, opposite leaves and flowers in terminal panicles. Calyx campanulate, enlarged in fruit and deeply divided. Segments 5, Corolla-tube long, limb spreading, oblique, lobes 5 subequal. Stamens 4, didynamous. Ovary imperfectly 4-celled, ovules 4. Drupe succulent or dry, separating into four 1-celled or two-celled pyrenes.

425 **C. infortunatum**, Gærtn ; Fl. Br. Ind. iv. 594 ; Bedd. Fl. Syl. clxxiii ; Trimen Fl. Cey. iii. 361 ; Gamble Man. Tim. 543 ; Brandis Ind. Tr. 507. Tam. *Pergilei*. Mal. *Vatta perivellam*.

Leaves 4-7 in. each way, ovate, cordate, acuminate, entire or dentate, softly pubescent on both sides, venation prominent beneath. Petiole 1½ 3 in. Flowers white, 1 in long, in large, erect, pubescent panicles. Drupe globose, succulent, ⅓ in. diam. purplish-black, in the centre of a much enlarged, spreading, pink calyx 1½ in. across.

A quick-growing soft-wooded tree up to 30 ft. high and 6 in. diam. often only a shrub of 10-15 ft very abundant in all waste land from the foot of the hills to 3000 ft. and difficult to eradicate. Occurs through India and Ceylon and in the Malay Peninsula.

Flowers and fruits throught the year but chiefly in August.

The timber has not been examined. Trimen notes that the leaves have a smoky odour when bruised : they are used as an anthelmintic, "The juice of the leaves is employed by the natives as a vermifuge, and also as a bitter tonic and febrifuge in malarious fevers, especially in those of children." (Dict. Econ. Prod)

4. GMELINA.

Trees with opposite, simple, entire leaves and large yellow flowers in terminal panicles. Calyx cup-shaped, 4-or 5-toothed. Corolla funnel shaped, swollen above, lobes 4 or 5, the lower one largest and forming a projecting lip. Stamens 4, didynamous. Ovary 4-celled with 1 ovule in each cell. Drupe succulent, stone bony, 2-4-celled and seeded.

426 **G. arborea**, Linn ; Fl. Br. Ind. iv. 581 ; Bedd. Fl. Syl. t. 253 ; Trimen Fl. Cey. iii. 355 ; Gamble Man. Tim. 537 ; Brandis Ind. Tr. 509. Tam. *Umi thekku*. Mal. *Kumbil*.

Leaves 3-10 in. by 2½-8 in., broadly ovate, base rounded or cordate, acuminate, dark green and glabrous above, covered with a dense white tomentum beneath, where also are 2 large glands at the base of the leaf. Petiole 2-5 in. Flowers yellow, 4 upper lobes dull orange-pink within 1½ in. long, hairy outside, borne in terminal panicles. Drupe ovoid, 1 in. long, smooth and sweet-smelling.

A medium-sized deciduous tree of the open forests at the lower elevations from sea-level to 2000 ft. widely distributed but not abundant. Height 60 ft. Diam. 2 ft. Occurs through India, except in the very dry parts, in Ceylon and Burmah.

Flowers March—April. Fruits Nov—Dec.

Bark pale, covered with small lenticels, ½ in. thick. Wood greyish white with a glossy lustre, smooth, close-grained and moderately hard. light, strong and durable. No heartwood. Pores large and medium-sized, often subdivided. Rays white short, prominent and visible on a vertical section. Annual rings marked by white lines about 4 to inch.

W=35 lbs. P=523

This is an excellent wood it does not warp or contract, it is easily worked, readily takes paint or varnish and is very durable under water. Insects do not attack it in spite of its comparative softness. Unfortunately, it is not abundant any where, nor does it grow to a large size, trees above 1 ft. In diameter being scarce, hence it does not appear to be ever used in Travancore. Gamble says that it is the chief furniture wood of Chittagong and he quotes another writer as saying that it is " well calculated for light planking, panelling, " " blinds and venetians, and of much estimation for picture-frames, " " organ-pipes, scunding-boards and other such work where shrink- " " age is to be avoided. " The bark and root are used in native medicine.

5. PREMNA, Linn.

Trees with simple, opposite leaves and small flowers in terminal corymbiform cymes. Calyx small, entire, or 2—lipped or with 5 segments. Corolla-tube short, throat woolly lobes 4, unequal, one larger than the others forming 2 lips. Stamens 4. Ovary 2 or 4—celled with 4 ovules. Drupe small, fleshy, 2 or 4-celled.

Leaves entire, stellate-woolly beneath .. 1. *P. tomentosa*

Leaves dentate, glabrous or minutely pubescent beneath .... 2. *P. thyrsoidea*

1. P. tomentosa, Willd.; Fl, Br. Ind. iv. 576 ; Bedd. Fl. Syl. 427
t 251 ; Trimen Fl. Cey. iii, 352 ; Gamble Man. Tim. 536 ; Brandis Ind. Tr. 510. Tam. *Kolakatta thékku.*

Leaves 3-6 in. each way. broadly ovate, acuminate, entire, base rounded, densely woolly beneath. Petiole 1-2 in. Flowers yellow, very small and numerous, throat very hairy, arranged in terminal pubescent cymes. Ovary very hairy, Drupe $\frac{1}{4}$ in. broadly ovoid, hairy, containing one 4-seeded stone.

A medium-sized deciduous tree common in the drier parts of S. Travancore and near Puliyara, attaining a height of 60 ft. and a diameter of 15 in. but generally smaller. Occurs through Central and Southern India and in Ceylon.

Flowers with the young leaves in March and April Fruits in June.

The bark is light greyish-brown and thin. Gamble says that the wood is light-brown, smooth, close grained. Pores small or moderate sized, numerous, often subdivided, in transverse patches surrounded by loose tissue; Medullary rays numerous, fine to moderately broad, marked on a radial section as a minute, shining silver-grain, and he gives

W=60 lbs.

"A common Deccan tree with useful wood, but very little used. It would be suitable for turning, carving and fancy work " (Gamble). "Used in Burmah for making weaver's shuttles and has been recommended as suitable for turning and fancy work. (Dict. Econ. Prod). Not used in Travancore.

428 2. **P. thyrsoidea**, Wight; Fl. Br. Ind. iv. 579. Bedd. Fl. Syl. clxxiii (under *P. Wightiana* in part); Brandis Ind. Tr. 511. Tam. *Pinja.*

Leaves 3½ in. by 2 in. base rhomboid, ovate, acuminate, dentate, glabrous on both sides or minutely pubescent on the nerves, Petiole ¼-½ in. Flowers greyish-white, ⅙ in. long, in woolly thyrsoid panicles. Drupe globose 1/5 in.

A small tree found in the drier parts of Travancore the Anjanad valley, Puliyara &c. Height 30 ft. Diam. 6 in. Occurs also in Tinnevelly and Madura.

Nothing is known about this tree.

6. CALLICARPA, Linn.

Small trees covered with soft tomentum, with simple, opposite, entire leaves. Flowers small in axillary cymes. Calyx very small, faintly 4-toothed. Corolla-tube short, lobes 4, equal. Stamens 4. Ovary 2-celled with 2 ovules in each cell. Drupe succulent containing four 1-seeded pyrenes.

429 **C. lanata**, Linn.; Fl. Br. Ind. iv. 567. Bedd. Fl, Syl. clxxiii; Trimen Fl. Cey. iii, 350, Gamble Man. Tim. 525: Brandis Ind. Tr. 512. Tam. *Vettilei patta*, Mal. *Thin perivellam.*

Leaves 5-9 in. by 3-6 in. ovate, rounded at base. slightly acuminate, entire. glabrous, covered with a thick white felt beneath- Petiole 1-2 in. tomentose. Flowers purple, ¼ in. long, sessile in, axillary. branched, densely tomentose cymes Drupe ¼ in. globose black, shining, seeds angular.

A small tree or large shrub common on the hills between 2000 and 4,000 ft. especially at the edges of clearings. Height 25 ft. Diam 8 in. Found also through the hills of S. India and in Ceylon.

Flowers and Fruits at all times.

Bark ⅓ in. thick, brown. rough. Wood pale brown, smooth, moderately hard. Pores small very numerous. Rays very fine very numerous and close together, giving a silver grain on the longitudinal section. Annual rings none.

W=43 lbs. P=555.

The wood does not crack. and it is used for carving, the legs of cots, &c. The bark is sometimes used instead of the betel leaf, hence the Tamil name, and the root is used in decoction. "The leaves, roots and bark are used locally by the natives for skin diseases; they are very bitter." (Dict. Econ. Prod.)

7. AVICENNIA, Linn.

Trees with simple, opposite, entire leaves. and moderate-sized flowers arranged in terminal panicles, Calyx shallow. segments 5, cut almost to base, imbricate. Corolla-tube short, lobes 4, spreading. Stamens 4, alternating with corolla lobes. Ovary hairy, imperfectly 4-celled with 4 pendulous ovules. Fruit a soft 2-valved capsule containing one seed.

A. officinalis, Linn. ; Fl. Br. Ind. iv. 604 . Bedd. Fl. Syl. clxxiv, Trimen Fl. Cey. iii 363 , Gamble Man. Tim. 546 ; Brandis Ind. Tr. 514. Tam. *Upattha*. Mal. *Orei*. 430

Leaves $1\frac{1}{2}$-3 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in oval, acute at base, rounded at apex, glabrous. bright green and shining above, covered with a dense silvery tomentum beneath, branchlets and petioles similarly covered, Petiole $\frac{3}{4}$ in Flowers pale yellow, sessile $\frac{1}{3}$ in. across 6 or 8 together in cymose panicles. Capsule pale yellow, obliquely ovoid. 1 in long.

A medium-sized much branched tree common on the banks of tidal backwaters throughout Travancore. Height 30 ft. Diam 1 ft. Occurs through India, Ceylon and Burmah.

Flowers in April. Fruits in May--June.

Gamble says that the bark is greyish-brown, thin. Wood brown or grey hard, in alternate layers of pore-bearing tissue and loose large-celled tissue without pores. Pores large to small in radial lines of 1 to 5. Medullary rays fine and short, and he gives

W = 49 lbs. (average)

This tree is found in company with the "Mangroves" and its wood is very peculiar on account of its alternate layers. It is very brittle and is used only for firewood Trimen says that the bark is astringent and might be used for tanning. and Beddome that a preparation made from the ashes of the wood is used by dhobies for washing cotton clothes and by painters to mix with their colours to make them adhere. "The kernels of the seed are bitter but edible." (Dict. Econ. Prod.)

MONOCHLAMYDEÆ.

Order LIX. MYRISTICACEÆ.

Evergreen trees with alternate, entire, simple, glabrous leaves without stipules, juice red. Flowers unisexual, diœcious, regular. Perianth usually with 3 (rarely 2) lobes, valvate. Anthers 12-30, more or less connate into a central column. Ovary superior. 1-celled with 1 erect ovule. Fruit fleshy or leathery, dehiscing into 2 valves showing the large seed enclosed in a coloured aril.

This Order contains *Myristica fragrans*, Houtt. the cultivated "Nutmeg" indigenous in the Moluccas, and 5 species wild in our forests. The timber of all is soft and worthless.

MYRISTICA. (Characters of the Order).

Anthers 12-30 adnate to a column which is often prolonged beyond them. Aril laciniate to base.

Male flowers numerous on a thick, woody tubercle.

Leaves over 12 inch., reddish-tomentose beneath . 1. *M. magnifica*

Leaves under 10 in. glaucous beneath . 2. *M. Beddomei.*

Male Flowers in panicled cymes, peduncles slender . 3. *M. malabarica*

Anthers 6-12, lower portion adnate to an ovoid column. upper portion free. Aril laciniate nearly to base . 4. *M. canarica.*

Anthers 8-20 on a circular, stipitate disk. Aril laciniate at apex only . 5. *M. attenuata.*

431 1. M. **magnifica,** Bedd., Fl. Br. Ind. v. 104, Bedd. Fl. Syl, t. 268, Gamble Man. Tim. 556, Brandis Ind. Tr. 524. Mal. *Kottha pánu*.

Leaves 12 14 in. by 4-6 in. oblong, rounded at base, acute, coriaceous bright green when young, very dark green and glabrous when mature, densely covered with reddish tomentum beneath. veins prominent. Petiole stout $\frac{1}{2}$-1 in. Flowers urceolate rusty-tomentose, ; male $\frac{1}{4}$ in. long, crowded 10-20 together on woody tubercles, anthers in an undivided staminal column. , female $\frac{1}{3}$ in. long, 2 or 3 together in axils of leaves. Fruit oblong-ovoid, about 4 in. by 3 in. covered with tomentum, enclosing a cylindrical, brown seed surrounded by an orange-red aril.

A very lofty tree often buttressed, common on swampy ground in evergreen forests at the foot of the hills especially near Kulathupuzha, but local It throws out numerous adventitious roots which spread along the ground and rise in loops above it. Height 120 ft. Diam 3 ft. Peculiar to Travancore and parts of Tinnevelly and Kanara.

Flowers from Dec.—Feb Fruits Oct—Dec.

Bark purplish-black, smooth. No heart. Wood yellowish-white, reddening with exposure, soft, straight-grained and even, but very perishable Pores numerous medium-sized, often divided, in radial lines of 2 or 3 Rays brown, very fine, numerous and equidistant. Annual rings marked by concentric lines of paler tissue 12 to inch.

W = 30 lbs. P = 375.

The wood is of no use.

432 2. M **Beddomei,** King: Fl. Br. Ind. v. 103 (under *M. laurifolia*) Bedd Fl. Syl. t. 267, Gamble Man. Tim. 556; Brandis Ind. Tr 524. Eng. *The wild Nutmeg*. Tam. *Káttu jathikai*, Mal. *Pattha pánu*, *adakka payin*.

*Leaves 5-10 in. by $2\frac{1}{2}$-4 in oblong acute rounded at base, glabrous and dark-green above, glaucous beneath, coriaceous, veins prominent beneath Petiole about 1 in. Flowers white, $\frac{1}{4}$ in. long, tomentose ; male on stout woody tubercles 10-20 together, column of anthers undivided , female rather larger, 3 or 4 together. Fruit 2-3 in long by $1\frac{1}{2}$-$2\frac{1}{2}$ in. diam. ovoid, aril orange-red, laciniate to base.

A large tree of the evergreen forests common from sea level to 4000 ft throughout Travancore. Height 90 ft. Diam. $2\frac{1}{2}$ ft. Occurs also on the Neilgherries and Anamalays and other hills of S. India. Flowers Dec.– Jan. Fruits June to July.

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*Beddome, Trimen and Brandis regard *M. Beddomei* as identical with the Ceylon tree *M. laurifolia* but King who has made a special study of this genus considers them as distinct species.

Bark blackish-green rather smooth, ½ in thick. No heart. Wood yellowish-brown, straight-grained, even, fairly smooth, moderately hard. Pores medium-sized, often divided, scanty, in lines of 2 or 3. Rays fine and numerous. Annual rings marked by concentric rings of light coloured tissue 12 to inch.

W=34 lbs. P=356.

The wood is very perishable. It has been tried for tea-boxes but does not equal Cotton-wood.

3. M. **malabarica**, Lamk, Fl. Br. Ind. v. 103: Bedd. Fl. Syl. t. 269; Gamble Man. Tim. 555, Brandis Ind. Tr. 524. Tam. *Pattiri*. Mal. *Ponnam pánu*. 433

Leaves 4-8 in by 2-4 in. linear-oblong, sub-acute pale green, very glossy above, glabrous beneath and glaucous. Petiole ¾ in. Flowers white, ¼ in long; male 10-20 together, in short panicled cymes springing from axils of old leaves, column of anthers undivided: female 3 or 4 together slightly larger. Fruit cylindrical 2-3 in. long by ¾ in diam. Seed elongate, aril yellow.

A moderate-sized tree of the evergreen forests, confined to elevations below 1000 ft. through Travancore. Height 50 ft. diam. 1½ ft. Occurs all along the Western Ghats from Kanara southwards, absent from Ceylon.

Flowers in Feb—March. Fruit ripens Dec.—Jan.

Bark greenish-black, smooth. No heart. Wood yellowish-brown with a grey tinge, straight-grained, even and fairly smooth, moderately hard. Pores medium sized, scanty, frequently divided, in radial strings. Rays fine, equidistant, inconspicuous. Annual rings marked by rings of lighter tissue about 12 to inch.

W=34 lbs. P=460.

The wood is much attacked by insects and is very perishable. The mace is collected and sold in the bazaars as "ponnan pu". It possesses a slight fragrance. Gamble says that the seeds give an oil which is used to burn and as an ointment.

4. M. **canarica**, Bedd; Fl Br. Ind, v. 108 (under *M. Faraquhariana*) Bedd. Fl Syl t. 270 (under *M. Farquhariana*) Gamble Man. Tim, 556. Brandis Ind. Tr 525. Mal. *Undei pánu*. 434

Leaves 5 to 10 in. by 2-4 in. oblong with a fine acumination, base rounded, glabrous and shining above, glaucous beneath. Petiole about ½ in. Male Flowers ⅙ in. long, yellow, in much branched axillary panicles, anthers attached to the column only below, free above. Female flowers rather larger, 6-10 together in 1-inch axillary racemes. Fruit globose 1-1¼ in. diam glabrous, seed round, pale brown, ¾ in. diam.

A very large tree found in company with *M. magnifica* in the evergreen forests near Kulathupuzha, but not confined to swampy ground. Does not ascend above 1000 ft. Height 120 ft. Diam. 2 ft. Occurs also on the Western Ghats, Tinnevelly and Malacca but not in Ceylon.

Flowers in March—April. Fruits in July-Aug.

Bark smooth, brown. $\frac{1}{3}$ in. thick. No heart. Wood yellowish-grey, coarse, moderately hard. Pores scanty, medium sized, generally divided, arranged in radial strings. Rays fine, inconspicuous and close-packed. Annual rings indistinct.

W=34 lbs. P=409.

The wood is very perishable and useless.

435 5. **M. attenuata.** Wall ; Fl Br. Ind. V. 110 ; Bedd. Fl. Syl. t. 271 (under *M Corticosa*) ; Gamble Man. Tim. 557 ; Brandis Ind Tr. 525. Tam. *Chóra pathiri*. Mal. *Chóra χánu* , *chen nelli*.

Leaves 5-8 in by 1½-3 in. lanceolate acuminate, dark green and glossy adove, glaucous beneath. Petiole ¾ in covered with rusty tomentum. Flowers rusty-tomentose, small, triangular, ¼ in across: male 3 or 4 together borne on short pedicels all along the branches, anthers on the edge of a purple disk. female longer, 3-5 together in axils of leaves. Fruit 1½ in long, ovoid apiculate, covered with a rusty tomentum, pericarp thin, seed surrounded by a brilliant crimson aril.

A tree of medium-size very abundant in all our evergreen forests up to 2000 ft. Height 60. Diam. 1½ ft. Occurs also on the Western Ghauts from Kanara southwards, absent from Ceylon.

Flowers in Dec—March. Fruits in May—June.

Bark greenish-black, smooth, ¼ in. thick. No heart. Wood pale brown prettily streaked, moderately hard. Pores small or medium-sized, scanty, usually divided. Rays fine, inconspicuous, few. Annual rings indistinct.

W=35 lbs. P=514.

The wood of this tree like that of others of genus is very perishable and worthless. It is slightly superior to them.

ORDER LX. LAURACEÆ.

Trees with simple, alternate or opposite, often whorled,, leaves without stipules. Flowers regular, bisexual, polygamous or unisexual, solitary or in heads. Perianth regular, deeply 6-(or 4-) c left, tube often enlarged in fruit. Stamens 6-20, usually 9 in 3 rows,

with a fourth row of 3 staminodes sometimes added, filaments usually flattened, sometimes with 2 glands near the base, anthers 2-or 4-celled opening by valves- Ovary free, 1-celled with one pendulous ovule. Fruit dry or fleshy, often surrounded by the persistent perianth-tube, seed one.

A large Order containing 22 species indigenous in Travancore, but when all the interior forests, and especially those on the higher ranges, have been throughly explored it is probable that considerable additions will be made to the number. Many of the species here and elsewhere contain an essential aromatic oil, such as *Cinnamomum zeylanicum* Breyn the "Cinnamom" of India and Ceylon, *C Cassia*, Bl. which yields the "Cassia" bark of China *C, Camphora*, Nees the "Camphor" tree of Japan and China, *Laurus nobilis* the Sweet Bay" of Europe and others.

Flowers solitary, bisexual, generally paniculate, anthers 2 or 4 celled.

Anthers 2 celled.
- Perianth-tube accresent, enclosing the fruit . . . 1. *Cryptocarya.*
- Fruit supported at base by the perianth . . . 2. *Apollonias.*
- Perianth deciduous . . . 3. *Beilschmiedia.*

Anthers 4-celled.
- Perianth segments persistent reflexed . . . 4. *Machilus.*
- Perianth wholly deciduous, pedicel thickened . . . 5. *Alseodaphne.*

Flowers solitary, polygamous or bisexual, paniculate, anthers 4-celled.
- Perianth-segments erect, clasping base of fruit . . . 6 *Phœbe.*
- Perianth-tube enlarged supporting fruit, segments deciduous . . . 7 *Cinnamomum.*

Flowers dioecious in bracteate heads, anthers 4-celled.
- Bracts imbricating not whorled . . . 8 *Actinodaphne.*
- Heads supported by 4-6 whorled bracts . . . 9 *Litsœa.*

1. CRYPTOCARYA, Brown.

Trees with alternate, entire reticulate leaves, and small bisexual flowers in panicles. Perianth-tube turbinate, segments 6. Stamens 9 in 3 rows, anthers 2-celled, filaments of 1st and 2nd row without glands, anthers introrse, filaments of 3rd row with glands, anthes extrose, staminodes 3. Fruit completely enclosed in the persistent perianth-tube.

- Leaves whitish beneath, acuminate. petiole over ½ in . . . 1. *C. Wightiana.*
- Leaves glucous beneath, obstuse. petiol under ¼ in . . . 2. *C. Stocksii.*

I. C. Wightiana.; Thw Fl. Br. Ind. v. 120; Bedd Fl. Syl. t. 299; Trimen Fl. Cey. iii. 439; Gamble Man. Tim. 559; Brandis Ind Tr. 527. Mal *Kadamán pári*. 436

Leaves 2·8 in. by $1\frac{1}{2}$-4 in oblong, acuminate, glabrous above, glaucous white beneath. Petiole $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers $\frac{1}{8}$ in long, yellow very numerous in large panicles 3-5 in long. Fruit $\frac{3}{4}$ in long, ovoid, purplish black slightly ribbed and shining.

A large tree found sparingly in evergreen forests from sea-level te 2500 ft. Height 70 ft. Diam 2 ft. Occurs also on the Western Ghauts from Kanara southwards, in Tinnevelly and Ceylon.

Flowers in Nov. Fruits in May and June.

Bark brown and smooth, $\frac{1}{2}$ in thick. No heart. Wood pale yellowish-brown, smooth, even but apt to split moderately hard. Pores medium to small, numerous, evenly distributed. Rays very fine and visible, white. Annual rings marked by darker lines 16 to inch.

W = 44 lbs. P = 666

The wood is not used.

437 **2. C. Stocksii,** Meissn; Fl. Br. Ind. v. 120; Gamble Man. Tim. 558; Brandis Ind. 527.

Leaves $2\frac{1}{2}$-4 in. by $1\frac{1}{2}$-2 in oblong, obtuse at both ends glabrous beneath. Petiole $\frac{1}{4}$ in Flowers $\frac{1}{4}$ in long, yellow, in small panicles. Fruit $\frac{1}{3}$ in. long, ovoid, dull purplish-black.

A large tree of the evergreen forests, scarce, from 2000 to 5000 ft Height 60 ft. Diam. $1\frac{1}{2}$ ft. Found also on the Western Ghauts Neilgherries and Anamalays, not in Ceylon.

Flowers in April-May. Fruit June-July.
The wood has not been tested or weighed, nor is it used.

—2. APOLLONIAS. Nees.

Trees, with alternate, entire, penniveined leaves, and small, bisexual flowers in axillary or terminal panicles. Perianth-tube short, segments 6. Stamens 9, anthers 2-called filaments filiform, first 2 series introrse without glands, 3rd series extrorse with 2 glands to each staminodes 3. Fruit a berry supported at the base by the perianth.

438 **A. Arnotti,** Nees Fl Br Ind. v 321, Bedd, Fl Syl. t 291, Gamble Man. Tim. 558. Brandis Ind. Tr. 528. Mal. *Chenthanam.*

Leaves 3-6 by 1-2 in tapering to both ends, much acuminated, veins distant, glabrous and shining above when mature, pink when young. Petiole $\frac{1}{3}$in Flowers greenish-yellow $\frac{1}{6}$ in. long, borne in open panicles 1 to 2 in. long. Fruit $\frac{1}{2}$ in. long, pale green, ovoid.

A tree of medium size abundant in evergreen forest between 2500 and 5000 ft Height 50 ft. Diam. $1\frac{1}{2}$ ft. Occurs also in Malabar. the Neilgherries and Tinnevelly.

Flowers from Dec.—Jan. Fruits May-June.

Nothing is known of the wood or its uses.

3. BEILDSHMIEDIA, Nees,

Evergreen trees with opposite or alternate entire leaves, and bisexual flowers in axillary and terminal panicles or racemes. Perianth wholly deciduous. tube short, segments 6 ; Stamens 9 anthers 2-celled, staminodes 3 cordate. Fruit not enclosed in perianth.

Flowers in 1-in racemes enclosed in silky bracts filaments and ovary hairy . 1. *B. Bourdilloni*

Flowers in 4 in. panicles without bracts, filaments and ovary glabrous . 2. *B. Wightii*

1. B **Bourdilloni,** Brandis, Gamble Man Tim. 559 (under No. W. 4590) Brandis. Ind Tr. 528. Mal *Mora kutthi.* 439

Leaves 3-7 in. by $1\frac{1}{2}$-3-in generally opposite. sometimes alternate, ovate-lanceolate, acuminate. tapering to base, very glabrous and shining above, with 6.1 pair conspicuos veins. Petiole $\frac{1}{2}$-1 in. Flowers $\frac{1}{3}$ in across, greenish yellow, all parts ubescent in short axillary and terminal 1-in. racemes, when in bud enclosed in broad, concave, silky bracts. Fruit pubescent when young, at length glabrous, purple, cylindrical, 1-$1\frac{1}{2}$ in. by $\frac{3}{4}$ in diam. peduncle red

A large tree of the evergreen forests from sea-level to 1500 ft. common. Height 90 ft. Diam $1\frac{1}{2}$ ft Found also on the Shevaroys.

Flowers in Jan.-Feb. Fruit ripens June-July.

Bark dark green, $\frac{1}{3}$ in. thick Wood pale brown. hard and heavy. Pores small, surrounded by the white rings, arranged in broken radial lines. Rays fine, pale, connected by fine cross bars of the same colour.

W=51 lbs.

The wood is not used.

2. B **Wightii,** Benth, Fl Br. Ind. v 124, Bedd. Fl Syl. t. 298 (under *Haasia Wightii*), Gamble Man. Tim. 559, Brandis Ind. Tr. 529. 440

Leaves 3-6 in. by $\frac{3}{4}$-$2\frac{1}{2}$ in subopposite, ovate-lanceolate, tapering to both ends, acuminate, glabrous and shining. Petiole $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers minute, greenish-yellow, filaments and ovary glabrous, borne in open 4 in. panicles without any silky bracts. Fruit ovoid, purple $\frac{3}{4}$ in. long, smooth.

A large tree of the evergreen forests, found here and there in our forests from sea-level 4000 ft. Height 90 ft. Diam. 2 ft. Found also on the Anamallays and Tinnevelly.

Flowers April-May. Fruits Dec.-March.

Bark brown, rough, $\frac{2}{3}$ in. thick. No heart but the wood is darker in the centre. Wood hard, greyish-white with a wavy grain, smooth. Pores small, numerous. Rays very fine, white, distant. Annual rings marked by white lines 20 to inch.

W=42 lbs. P=515.

The wood is not used.

4. MACHILUS, Nees.

Trees with alternate, entire, penniveined leaves. Flowers bisexual in axillary and sub-terminal panicle. Perianth tube very short, segments 6 persistent in fruit. Stamens 9, anthers 4-celled, staminodes 3. Fruit globose, seated on the enlarged and reflexed perianth-segments.

441 **M. macrantha**, Nees. Fl. Br. Ind. v. 140, 861. Bedd. Fl. Syl. t. 261. Trimen Fl. Cey. iii 443. Gamble Man. Tim. 567. Brandis Ind. Tr. 530. Tam. *Kolla mávu*. Mal. *Urávu*.

Leaves 4-8 in. by 1½-3 in. oblong or spathulate, obtuse or acute, generally tapering to base, pale green and reddish when young, at length dark green above, glaucous. beneath, crowded at the ends of branches. Petiole 1-1½ in. Flowers ½ in. across pale yellow, numerous in terminal, divaricate panicles 6.8 in. long. Fruit globose. flattened at ends, nearly ¾ in. diameter, very dark green with white specks, smooth and aromatic.

A large tree very common in evergreen and deciduous forests from sea-level to 4000 ft. Height 90 ft. Diameter 2½ ft. Also found on the Western Ghauts from Matheran southward and in Ceylon.

Flowers Dec.-Jan. Fruits in April and May.

Bark pale brown marked with darker blotches, rough. $\frac{1}{3}$ in. thick. Wood reddish-white, darkening with exposure to reddish-brown, coarse, rough, moderately hard, often with shining plates. Pores numerous, medium sized, often divided. Rays fine, numerous and conspicuous. Annual rings marked by darker, indistinct, concentric lines, about 5 to inch.

W.=36 lbs. P.=408.

The wood is used for rough canoes, but is not lasting. It is somewhat largely used for common planking, but is inferior to mango-wood, and is weak and liable to be eaten by insects.

5. ALSEODAPHNE, Nees.

Trees with alternate, entire, penniveined leaves crowded at the ends of the branchlets. Flowers bisexual, in lax, axillary panicles. Perianth deeply cut into 6 segments, deciduous. Stamens 9 anthers

4-celled, staminodes 3. Fruit large, oblong-ovoid supported on a thikened stalk, but without any persistent perianth.

A. semecarpifolia, Nees; Fl. Br. Ind. v. 144; Bedd. Fl. Syl. t. 297; Trimen Fl. Cey. iii. 444; Gamble Man. Tim. 568; Brandis Ind. Tr. 531. 442

Leaves 3-9 in. by $1\frac{1}{2}$-4 in. oblong-oval or obovate, tapering to base, usually rounded at apex, coriaceous, glabrous and shining above, glaucous beneath. Petiole $\frac{1}{4}$-1 in. Flowers small, yellowish-green, on slender, lax panicles 3-10 in. long. Fruit about 1 in. long, smooth, on $\frac{3}{4}$ in. stout peduncles.

A large tree said by Beddome to be "not uncommon on the Western Ghauts from Canara down to Cape Comorin up to 5000 ft. elevation" but I have not seen it. In Ceylon and the Concan it is confined to the drier regions. It may therefore be looked for about Aramboli, Puliyara and on the Cardamom Hills.

Gamble says that the bark is yellow-brown, thick, vertically-furrowed. Wood dark brown, moderately hard. Pores moderate-sized, scanty, enclosed in loose tissue. Medullary rays, fine wavy not numerous, and he gives.

W = 47 lbs. (according to Prof. Unwin W = 63 lbs.)

Trimen describes it as "one of our best timber treees." The wood is exported from Trincomalee: it is heavy, durable, straight-grained, pale greyish-orange, and can be obtained of large size. Beddome also highly commends it. In Travancore it is not used.

6, PHŒBE Nees.

Trees with alternate, entire, penniveined leaves, often clustered at the ends of branchlets. Flowers bisexual or polygamous in axillary and terminal panicles. Perianth-tube short, segments erect and persistent. Stamens 9. Anthers 4-celled, staminodes 3. Fruit oblong, clasped at the base by the hardened perianth segments.

P. lanceolata, Nees. Fl. Br. Ind. 141; Bedd. Fl. Syl. clxxxiv. Gamble Man. Tim. 568; Brandis Ind. Trees. 532. 443

Leaves 3-10 in. by 1-$1\frac{1}{2}$ in. ovate-lanceolate, finally acuminate, tapering to base, coriaceous, glabrous, pale brown beneath. Petiole $\frac{1}{4}$-$\frac{3}{4}$ in. Flowers pale yellow, $\frac{1}{8}$ in. long, in long-peduncled panicles. Fruit $\frac{1}{3}$ in. long, ovoid supported by the perianth-segments.

A tree of medium size, found at Body Mettu and in the Anjinad valley, not observed elsewhere by me Height 40 ft. Diam 1 ft. Found also in the Wynad, on the Anamallays and in Tinnevelly, and in N. India and Burmah, but not in Ceylon.

Flowers and fruits in Jan.-Feb.

Gamble says that the wood is hard, close-grained: sapwood and wood of young trees greyish-white, heart-wood olive brown. Annual rings marked by a distinct line. Pores moderate-sized, often oval and sub divided, or in short radial lines, uniformly distributed. Medullary rays fine, equidistant, and he gives.

W = 51 lbs. (average)

The wood does not seem to be used anywhere.

7. CINNAMOMUM, Blume.

Trees with entire, opposite or alternate, usually triple-veined leaves. Flowers bisexual or polygamous, in axillary or subterminal panicles or racemes Perianth-tube short, segments deciduous, or persistent and enlarged with fruit. Stamens 9, anthers 4-celled, staminodes 3. Fruit ovoid, supported by the persistent perianth with or without segments.

Leaves exceeding 1 in. broad

Underside of leaves add young parts glabrous .. 1. C. *zeylanicum*.

Underside of leaves and young parts fulvous-tomentose .. 2. C. *sulphuratum*.

Leaves less than ½ in. broad .. 3. C. *gracile*.

444 **1. C zeylanicum**, Breyn; Fl. Br. Ind. v, 131; Bedd. Fl. Syl. t. 262; Trimen Fl. Cey. iii. 440, Gamble Man. Tim. 562; Brandis Ind. Tr. 533. Eng. *The Cinnamon tree.* Tam. *Karuvi*, *lavanga*. Mal. *Karuvá*, *varana*: *edana*; *eringolam*.

Leaves 3-10 in, by 1½-4 in. sub-opposite, ovate or oblong, shortly acuminate, obtuse, rounded or narrowed to the base, hard and coriaceous glabrous and shining above, finely reticulated and prominently 3-or 5 nerved, bright pink when young. Petiole ½-1 in. stout, flattened above. Flowers ⅛-¼ in. pale yellow, in open terminal and axillary panicles. Fruit bright blue, smooth. oblong-ovoid ¾ in. long. surrounded by the enlarged perianth.

A very variable tree sometimes with large oblong leaves, (the low-country form), sometimes with small oval leaves (the hill form with gradations of all kinds between, common in the evergreen) forests from sea-level to 5000 ft. Height 80 ft. Diam. 2 ft. Also occurs through Southern and Western India, in Ceylon and Burmah.

Flowers Dec.-March. Fruits Sep.-Dec.

Bark reddish-brown with warty excrescence, ¾ in, thick. Wood pinkish-brown, coarse, moderately hard. Pores small or medium-sized, very numerous, Rays fine, brown. bent where they touch the pores. Numerous concentric lines of darker and lighter tissue which may be annual rings.

W = 36 lbs. P = 593 another specimen gave W = 37 lbs. P = 453.

All parts of the tree are highly aromatic. but the most useful part is the bark which is the Cinnamon bark of commerce. I have never heard of its being collected in Travancore, but in Ceylon there are large plantations of cinnamon extending to extending about 43,500 acres (in 1900 and the value of the export trade was about 25 lakhs of rupees, the best quality fetching 1 s. 3 d. per lb, (Gamble). Trimen says that an essential oil is distilled from both the bark and the leaves and that the root affords a camphor. The oil is largely used in medicine and perfumery. The wood is sometimes used in the hills for rough planking, but its quality is poor.

445 **2. C. sulphuratum**, Nees; Fl. Br. Ind. v. 132; Gamble Man. Tim, 560: Brandis Ind. Tr. 534.

Leaves 2-4 in. by 1 1½ in. ovate-lanceolate, opposite, acuminate, base acute, underside of leaves and panicles densely fulvous-tomentose, above glabrous. Petiole ⅓ in, Flowers pale yellow, ¼ in. few

in small panicles shorter than the leaves, perianth-lobes persistent Fruit ½ in. ovoid, purplish-blue.

A small tree common at the higher elevations at 4,000 ft. and upwards. Height 30 ft. Diam. 10 in. Occurse also on the Neilgheries and Western Ghauts.

Flowers in Jan.-Feb. Fruits in Sep.-Dec.

The wood has not been tested.

3. **C. gracile**, Hook. Fl. Br. Ind. v. 133. Trimen Fl. Cey. 560. 446
Brandis Ind. Tr. 534. Mal. *Atta karuva.*

Leaves 2½-4 in. by ⅓-¾ in, linar-lanceolate, opposite, acuminate, tapering to base, pale yellow when young, dark green and glossy when old, glabrous on both sides. Petiole ¼ in. Flowers pale yellow ¼ in. few, in open axillary and leaf-opposed panicles 3·4 in. long. Fruit ½ in. long, bright blue and shining, ovoid.

A graceful little tree common on river banks in the low country, especially about Malayattur in N. Travancore. Height 20 ft. Diam. 8 in.

Flowers Dec.-Feb. Fruits Sep.-Dec.

Bark ¼ in. thick. pale and dark green, mottled, covered with lenticels. Wood sweet-scented, pale brown, glossy, rather soft. Pores numerous, medium-sized. Rays fine and very abundant. No annual rings.

W = 31 lbs.

8. ACTINODAPHNE, Nees.

Trees with penniveined leaves, whorled or crowded at the ends of branches. Flowers diœcious in small axillary clusters or umbels, bracts imbricating, caducous. Perianth-tube short, segments six. Stamens in male flowers 9, anthers 4-celled introrse, staminodes none. In female flowers staminodes 9. Fruit globose, seated on the enlarged perianth-tube.

Leaves exceeding 4 in. acute.
  Leaves glabrous or pubescent beneath.
    Leaves pubescent beneath, ovate-lanceolate . 1. *A. Hookeri.*
    Leaves glabrous and glaucous beneath, linear-lanceolate . 2. *A. madraspatana.*
  Leaves densely brown tomentose beneath . 3. *A. hirsuta.*
Leaves under 4 in. obtuse . 4. *A. stenophylla.*

1. **A. Hookeri**, Meissn. Fl. Br. Ind. v. 149. Gamble Man. 447
Tim. 569. Brandis Ind. Tr. 534. Mal. *Mala virinya.*

Leaves 5-10 in. by 2-4 in. ovate-lanceolate, tapering to both ends, young leaves rusty-tomentose, at length glabrous and shining above, tomentose beneath, coriaceous. Petiole ½ in. Flowers pale yellow, small, in silky clusters about 1½ in. long, from axils of old leaves. Fruit ⅓ in. globose, dark green, smooth and pungent, seated on the enlarged perianth-tube.

A large tree of the evergreen forests fairly common from 500 to 5000 ft. stem often buttressed. Height. 70 ft. Diam. 1½ ft. Found also on the Western Ghats from Matheran southwards.

Flowers Dec.-Feb. Fruits April-June.

Bark brown, rough, $\frac{1}{3}$ in. thick. Wood pale olive, prettily streaked and mottled especially in the centre, smooth, moderately hard, even-grained, elastic. Pores small, numerous, evenly distributed or in oblique lines. Rays moderately broad, uniform and conspicuous. Annual rings marked by dark lines 15 to inch.

W = 54 lbs. P = 907.

A good wood but never used.

448 2. **A. madraspatana**, Bedd.: Fl. Br. Ind. v. 149; Bedd. Fl. Syl. t. 296 (under *A. Hookeri*). Gamble Man. Tim. 569; Brandis Ind. Tr. 534. Tam. *Thili*: *patta thili*. Mal. *Mungáli · iyóli*

Leaves 3-9 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. linear-lanceolate, acute at both ends, young leaves white and very pubescent, mature dark green, glabrous and shining above, beneath glaucous, coriaceous. Petiole $\frac{1}{2}$ in. Flowers $\frac{1}{3}$ in. white, buds covered with red tomentum, about 10 together in short clusters from the axils of new and old leaves. Fruit globose, black, smooth, $\frac{1}{3}$ in. diam. seated on the enlarged perianth-tube.

A large tree very common in all evergeen forests in the low country, and ascending the hills to 2000 ft. Height 70 ft. Diam. $1\frac{1}{2}$ ft. Occurs also on the Neilgherries and other hills of S. India.

Flowers in July-Aug. Fruits ripen Feb.-March.

The wood has not been examined.

449 3. **A. hirsuta**, Hook: Fl. Br. Ind. v. 152: Gamble Man. Tim. 569; Brandis Ind. Tr. 534.

Leaves 4-6 in. by $1\frac{1}{2}$-2 in. elliptic-lanceolate, acuminate, smooth, and shining above, branchlets and leaves beneath hirsute and brown-tomentose. Female flowers long-pedicelled, umbellate or sub-racemose on a hirsute peduncle. Fruit seated on the cup-shaped, entire perianth-tube.

This tree was observed by Wight at Quilon many years ago, but it is no longer to be found here, all the forests in the neighbourhood having disappeared long ago. It is fairly common in the evergreen sholas of Peermade at 3500 ft. Height 60 ft. Diam $1\frac{1}{2}$ ft.

450 4. **A. stenophylla**, Thwaites; Fl. Br. Ind. v. 150; Bedd. Fl. Syl. clxxvi; Trimen Fl. Cey. iii. 446; Brandis Ind. Tr. 534.

Leaves. 2-4 in. by $\frac{1}{2}$-$\frac{3}{4}$ in. linear-oblong, obtuse, acute at base, finely reticulate, glabrous on both sides, dark green above, glaucous-white beneath. Petiole $\frac{1}{4}$ in. Flowers $\frac{1}{4}$ in. pale yellow, crowded on short pedicels, bracts and perianth silky. Fruit $\frac{3}{8}$ in. globose, purple, perianth-tube entire, cup-shaped.

An elegant, little tree, of the evergreen forests at elevations of 3000-4000 ft. in S. Travancore. Height 30 ft. Diam. 8 in. Also found in Ceylon.

Flowers in April-May. Fruits June-July.

Nothing is known of the tree or its uses.

9. LITSÆA, Lamk.

Trees with alternate penniveined leaves. Flowers diœcious in small umbels of 4-6, enclosed in bud by 4-6 large, concave, whorled bracts. Perianth-tube long or short, segments 4 or 6. Stamens usually 9, anthers 4 celled, all introrse. Fruit globose or ovoid, seated on the cup-shaped much enlarged perianth-tube.

Leaves penniveined.
- Perianth segments wanting, tube slightly enlarged : stamens about 20.
  - Leaves finely tomentose beneath . 1. *L. tomentosa*.
  - Leaves glabrous beneath . 2. *L. sebifera*.
- Perianth-segments 6, tube much enlarged : stamens 9-12.
  - Flower-heads fascicled . 3. *L. coriacea*.
  - Flower-heads in axillary racemes.
    - Leaves obtuse or rounded . 4. *L. Wightiana*
    - Leaves more or less acuminate.
      - Leaves under $\frac{3}{4}$ in. broad . 5. *L. Stocksii*.
      - Leaves over 1 in broad . 6. *L. glabrata*

Leaves triple-veined . 7. *L. zeylanica*

1. **L. tomentosa**, Heyne ; Fl. Br. Ind. v. 157 ; Trimen Fl. Cey. iii. 449 ; Gamble Man. Tim. 570 ; Brandis Ind. Tr. 536. 451

Leaves 4-10 in. by 2-4 in. oval or obovate-oval, acute at base, acute, glabrous above, finely tomentose and yellowish-white beneath, veins prominent beneath. Petiole $\frac{3}{4}$ in. Flowers numerous, pale yellow, in large, solitary, axillary umbels $\frac{2}{3}$ in. across, bracts tomentose. Stamens about 20, filaments slender. Fruit $\frac{3}{8}$ in. depressed-globose.

A tree of medium-size only seen by me on the High Range but probably to be found elsewhere in our evergreen forests. Height 30 ft. Diam. 10 in. Found also from Mahableshwar southwards on the Western Ghauts, in South India and Ceylon.

Flowers Jan.-March. Fruits Sep.-Dec.

The wood has not been examined, but Trimen says that it is moderately hard and heavy, close grained, yellowish. Not used in Travancore.

2. **L. sebifera**. Pers ; Fl. Br. Ind. v. 157; Trimen Fl. Cey. iii, 449 (under *L. chinensis*) ; Gamble Man. Tim. 570, Brandis. Ind. Tr. 536. 452

Leaves $2\frac{1}{2}$-9 in. by $1\frac{1}{2}$-4 in. oblong-oval, usually obtuse, acute at base, glabrous on both sides, pale beneath coriaceous, venation conspicuous beneath. Petiole $\frac{1}{2}$-$1\frac{1}{2}$ in. Flowers small, greenish-yellow, sub-sessile in axillary umbels $\frac{1}{2}$-$\frac{3}{4}$ in. across, globose in bud, Perianth-tube long, segments 0. Stamens about 20, filaments very hairy. Fruit globose, purple, $\frac{1}{4}$ in. diam.

A medium-sized tree of the evergreen forests from sea-level to 3,000 ft. rare. Height 40 ft. Diam. 1 ft. Occurs through India, Ceylon, Malaya and China.

Flowers Jan.-March. Fruits Sep.-Dec.

Gamble says that the bark is brown, 1 in. thick. Wood olive-grey, moderately hard, shining, close and even-grained, durable. Annual rings indistinctly marked by a white line. Pores small and moderate sized. Rays fine, and moderately broad, and he gives

W=47 lbs.

Gamble says that the wood though good is not much in demand as it is nowhere common. Trimen states that it is much used in house-building in Ceylon, and that the bark is glutinous and is used medicinally as an external application to bruises. The bark is employed as a mild astringent in dysentery and diarrhœa: an oil from the berries is used in rheumatism: the leaves have a pleasant odour of cinnamon. (Dict. Econ. Prod.)

453 3. **L. coriacea**, Heyne; Fl. Br. Ind. v. 166; Gamble Man. Tim. 572; Brandis Ind. Tr. 537: Tam. *Panni thali* Mal. *Maravetti thali*.

Leaves 4-7 in. by 1-3 in. ovate or lanceolate, narrowed to base. obtuse, sometimes mucronate, coriaceous, glabrous petioles and under-side of leaves harshly pubescent, young leaves very pale, mature, dark green. Petiole $\frac{1}{3}$ in. Flowers white, small, crowded in sub-sessile axillary umbels, bracts silky. Stamens 12, glabrous. Fruit greenish-white, ovoid, $\frac{1}{2}$ in. long, smooth and shining, seated on the thickened perianth-tube.

A small tree very common in all evergreen forests in the low country and up to 2000 ft. attains a height of 40 ft. and 1 ft. diam. Occurs also on the Western Ghauts.

Flowers in Sep.-Jan. Fruits May-June.

The timber is unknown. It is not used except for fuel.

454 4. **L. Wightiana.** Hook, Fl. Br. Ind. v. 177, Bedd. Fl. Syl. t. 293 (under *Tetranthera Wightiana*), Gamble Man. Tim. 572; Brandis Ind. Tr. 539.

Leaves 3-9 in. by $1\frac{1}{2}$-4 in. ovate-oblong, obtuse. tapering to base, coriaceous, veins prominent beneath, branchlets, undersides of leaves and inflorescence rusty-tomentose. Petiole $\frac{1}{2}$ in. Flowers yellowish-white $\frac{1}{4}$ in. long. in 4-flowered umbels arranged in axillary racemes 1-4 in. long. Fruit ovoid, $\frac{2}{3}$ in long, seated on the enlarged perianth.

A medium sized tree very common in the evergreen forests of the higher elevations from 3000 ft. upwards. Height 50 ft. Diam. $1\frac{1}{2}$ ft. Found also on the Western Ghauts from Kanara southwards, and on the Neilgherries.

Flowers April-Oct- Fruits Sept.-Jan.

Gamble says that the bark is light-brown and smooth with horizontal lenticels. Wood yellowish-brown, shining, hard. Pores small, often divided. Rays fine, white and numerous. Annual rings marked by a faint line, and he gives.

W=46 lbs.

Beddome says that it is used for rafters and various other purposes. Not used in Travancore.

5. **L. Stocksii**, Hook f: Fl. Br. Ind v. 176: Gamble Man. 445
Tim. 572; Brandis Ind. Tr. 539.

Leaves 1-3 in by $\frac{1}{2}$-$\frac{3}{4}$ in. lanceolate, acuminate, tapering to base, dark green and glabrous above, glaucous beneath. Petiole $\frac{1}{3}$ in. Flowers very small, yellowish-white, in 'umbels' arranged in axillary racemes 1-2 in. long, bracts tomentose. Stamens about 8. Fruit ovoid, $\frac{3}{4}$ in. long, bright-green. seated on the base of perianth.

An elegant little tree common at elevations above 4000 ft. in the evergreen forests. Height 20 ft. Diam 6 in. Also found on the Western Ghauts from Bombay southwards and on the Neilgherries.

Flowers and fruits in April-June.

Gamble says that it is a " large tree and that the bark is smooth,' " greyish-brown. Wood yellowish-grey, moderately hard. Pores ' " small, single or in pairs or in threes, evenly distributed." " Medullary rays fine, short, numerous, regular."

6. **L. glabrata**, Wall; Fl Br, Ind. v. 174; Gamble Man Tim. 456
572; Brandis Ind. Tr. 539 Mal. *Ongakanni.*

Leaves 4-7 in, by $1\frac{1}{2}$-2 in. lanceolate, acuminate, tapering to base, coriaceous, glabrous and shining, faintly reticulate beneath. Petiole $\frac{3}{4}$-1 in. Flowers white in stalked umbels arranged in axillary racemes $1\frac{1}{2}$-5 in long. Stamens 12, hairy. Fruit $\frac{3}{4}$ in diam. depressed-globose, bright-red, very glabrous, seated on the base of the perianth, 10 to 20 together.

A lofty tree of the evergreen forests near Ariankavu, also found on the High Range and elsewhere. Height 70 ft. Diam. $1\frac{1}{2}$ ft. Also found on the hills of Southern India.

Flowers in September. Fruits April-May.

Bark pale brown, smooth, $\frac{1}{4}$ in. thick. No heart. Wood pale olive-yellow with a pretty gloss, slightly mottled, smooth moderately hard. Pores moderately large, abundant, often divided. Rays fine, equidistant, uniform. conspicuous. Annual rings indistinct.

W=32 lbs, P=535.

A useful light wood, which does not seem to be attacked by insects, and might be employed for planking and boxes.

7. **L. zeylanica**, Nees; Fl. Br. Ind. v. 178; Bedd. Fl. Syl. t. 457
294; Trimen Fl. Cey. iii. 454; Gamble Man. Tim. 573; Brandis Ind. Tr. 540. Tam. *Molaga shembaga pilei.*

Leaves 3-7 in. by $1\frac{1}{2}$-$3\frac{1}{2}$ in. ovate or lanceolate, tripli-nerved from near the base, acute, base rounded, glabrous and dark-green above, glaucous beneath, somewhat undulate, finely reticulate. Petiole $\frac{3}{4}$ in. Flowers pale-yellow, $\frac{1}{3}$ in. long, in 4-flowered, sessile umbels, 2 or 3 together in axils of leaves. Stamens 6. Perianth turbinate, segments 4, deciduous. Fruit globse $\frac{1}{2}$ in. long, oblong-ovoid, apiculate, with the base of the perianth adhering but not. enlarged.

A large evergreen tree very common at all elevations from sea-level to 6000 ft. in evergreen forests. Height 60 ft Diam. 1½ ft. Widely distributed through India, Ceylon and Burmah,

Fowers in April—May. Fruits June-July.

Gamble says that the bark is thick, smooth and grey. Wood light-brown to yellow, moderately hard, even-grained. Pores small, often divided. Rays fine, numerous,

The wood is scented. Trimen says that it is rather light and is used for house-building, and Gamble that an oil is obtained from the fruit and used for burning.

Besides the above, I have several species of this genus yet to be identified or named.

Order LXI. PROTEACEÆ.

Trees with alternate (or scattered, sub-opposite or whorled) leaves, entire or toothed, without stipules. Flowers regular, bisexual, in axillary racemes. Perianth inferior, segments 4, valvately cohering in bud into a cylindrical tube, at length separating. Stamens 4, 'in' anthers 2-celled with a prolonged connective. Ovary superior, 1-celled with 2 ascending ovules, style long. Fruit indehiscent, dry, seed solitary.

A very variable Order largely represented in Australia and Africa by handsome trees with peculiar flowers, but containing only two trees indigenous in Travancore. To it belongs Grevillea robusta the "Silk Oak' of Queensland and New South Wales, which has been extensievly planted on Coffee and Tea Estates for shade and shelter. The wood is light reddish-brown and hard, and the rays are very broad and prominent. "The wood is handsome and if judiciously cut to show the silver-grain to the best advantage, would do well for panelling, parquet-flowers and furniture, but it requires careful seasoning" (Gamble). With us it seldom grows large enough to be used for building, but begins to die when it has attained a diameter of 15 inches.

HELICIA, Lour.

Characters of the Order.

Leaves petioled. acute at base, under 4 in. long ...1. *H. nilagirica*.

Leaves sessile, rounded at base, over 4 in. long. 2. *H. travancorica*.

458 **1. H. nilagirica.** Bedd; Fl. Br. Ind. v. 190; Bedd. Fl. Syl. clxxviii; Gamble Man. Tim, 576; Brandis Ind. Tr. 543.

Leaves 1½-3 in by ¾-1½ in. ovate or lanceolate, acute, much narrowed to base, coarsely dentate and prominently veined beneath. Petiole ⅓ in. Flowers arranged in racemes 2-3 in. long. Fruit ¼ in diam. smooth, globose, purple.

A small tree seen by me in the evergreen forests near Chemunji at 3000 ft. but nowhere else. Height 30 ft. Diam. 8 in Also found in the Neilgherries.

Flowers and fruits March-June

The wood is unknown.

2. H. travancorica, Bedd; Fl. Br. Ind. v. 191, Bedd. Fl. Syl. t. 301, Gamble Man, Tim. 576, Brandis Ind. Tr. 543. 459

Leaves 5-8 in. by 2-3 in. obovate-oblong, acute or obtuse, acutely and coarsely serrate, coriaceous, glabrous and shining above, densely reticulate beneath. Petiole none. Flowers 1 in. long, greenish-yellow, fragrant, in racemes from present or old axils about 4 in. long. Fruit globose, smooth, apiculate ¾ in diam.

A very handsome tree said by Beddome to be "not uncommon on the banks of streams on the' Travancore and Tinnevelly mountains above Papanasam at about 4000 ft. elevation" but not seen by me. Has not been observed anywhere else.

ORDER LXII. THYMELEACEÆ.

Trees with opposite or alternate, entire leaves without stipules Flowers small, regular, bisexual in clusters, heads or racemes. Perianth tubular, often with a ring of scales at the mouth, segments 4 or 5, imbricate Stamens 5 in one row, or 8 or 10 in 2 rows, anthers 2-celled. Ovary superior 1-or 2-celled with one pendulous ovule in each cell. Fruit usually dry and indehiscent, seed one.

An Order of little importance containing only one small tree indigenous in our forests. To it belongs *Aquilaria Agallocha* the "Eagle wood" of Assam and Burmah. It is a large tree with a strongly scented wood which fetches a high price.

Lasiosiphon, Fresen.

Small trees with alernate or opposite leaves. Perianth segments 5. Stamens 10. Ovary 1-celled. Fruit dry.

1. L. eriocephalus Dene. Fl Br. Ind. v 197. Bedd, Fl Syl. clxxix, Trimen Fl. Cey. iii 459, , Gamble Man. Tim. 578 Brandis Ind. Tr. 545. Tam. *Nácchi nár.* Mal. *Nanju.* 460

Leaves 2-3 in. by ½ in. lanceolate-oblong or linear, acute or obtuse, tapering to base, glabrous, thin. Petiole very short. Flowers ¾ in. long, bright yellow, covered externally with long white hairs, sub-sessile in dense, erect, terminal heads 1·2 in across, surrounded by an involucre of silky bracts. Fruit included in the lower half of the persistent perianth.

A large bush or small tree common in open forests at elevations above 4000 ft. Height 20 ft. Diam, 6 in. Occurs also on the Neilgherries and other hills of S. India and in Ceylon.

Flowers and fruits throughout the year.

Gamble says that the bark is "grey, rather smooth, inner bark fibrous. Wood white or yellowish-white, hard. Pores small, single or in groups of 2 to 4, which are scantily distributed in short, more or less concentric patches. Medullary rays fine, irregulary shaped," and he gives.

W. = 55 lbs.

Trimen says that " the bark affords a good fibre. it is also employed as a fish poison, and is used in medicine externally. " " The bark is a powerful vesicant " (Dict. Econ. Prod.)

ORDER LXIII. ELÆAGNACEÆ.

Small trees with alternate, entire often undulate, leaves covered with silvery scales beneath, without stipules. Flowers regular, bisexual (rarely polygamous). Perianth-tube scaly, narrow below, globose above, segments 4, valvate. Stamens 4 at mouth of perianth. Ovary superior, 1 celled with one erect ovule Fruit indehiscent enclosed in the thickened base of the perianth-tube.

This order contains only one small Travancore tree. Some species of the Order growing in other countries possess narcotic properties, and of others the fruit is edible.

461 ELÆAGNUS, Linn.

Characters of the order.

E. latifolia, Linn ; Fl. Br. Ind. v. 202 ; Bedd. Fl. Syl. clxxx ; Trimen Fl. Cey. iii. 461 ; Gamble Man Tim, 581 ; Brandis Ind. Tr. 547.

Leaves $1\frac{1}{2}$-5 in by 1-3 in. oval, rounded at apex, rounded or tapering to base, glabrous above, densely covered beneath with silvery rusty scales, Petiole $\frac{1}{3}$ in. Flowers $\frac{1}{3}$ in long, white or pale-yellow, sweet-scented, in axillary clusters. Fruit 1 in, or more long, ovoid oblong, ribbed, pinkish red and fleshy, capped with the persistent perianth-limb, seed $\frac{3}{4}$ in. pointed and ribbed.

A scandent shurb often thorny, very common at all elevations from 0-6000 ft. and said to grow into a small tree 6 in. diam. though I have never noticed this. Occurs also on the Neilgherries, Western Ghauts, Bengal, Ceylon and Burmah.

Flowers Oct.—Feb. Fruits May—June.

462 Gamble says that the bark is dark-brown $\frac{1}{4}$ to $\frac{1}{2}$ in. thick deeply cleft and peeling off in thick flakes. Wood light yellow, moderately hard. Pores small to large, scanty. Rays moderately broad and short, and he gives.

W=44 lbs.

"The fruit is eaten ; It is pleasantly acid and refreshing. The wood is a good fuel. " (Gamble).

ORDER LXIV SANTALACEÆ.

Trees with alternate or opposite entire leaves without stipules. Flowers regular, axillary or terminal, bisexual or polygamous, usually bracteate. Perianth-tube adnate to ovary, segments 4-8, valvate, often with a tuft of hairs on the upper surface. Stamens 4 or 5, opposite perianth-segments. Ovary inferior, 1-celled with 2 or 3 ovules Fruit a nut or drupe, seed solitary.

This order contains 2 trees indigenous in Travancore. Many of the plants and trees belonging to it, found in other countries, are parasitic on the roots of other trees like the sandalwood.

Unarmed trees. Leaves opposite. Flowers bisexual . 1. *Santalum*
Armed treas. Leaves alternate. Flowers polygamous 2. *Scleropyrum*.

1. SANTALUM, Linn.

Trees with opposite, coriaceous leaves. Flowers bisexual in axillary or terminal panicles. Perianth-segments usually 4 (sometimes 5). Stamens 4 (or 5) alternating with 4 rounded scales. Drupe globose.

S. album, Linn; Fl. Br. Ind. V. 231: Bedd, Fl. Syl. t. 256: Gamble Man. Tim. 585; Brandis Ind. Tr. 553. Eng. "*The Sandalwood tree*" Tam. and Mal. *Santhanam*. 462

Leaves $1\frac{1}{2}$-3 in. by 1-$1\frac{1}{2}$ in, opposite, ovate or ovate-lanceolate, acute, tapering to base, thin, glabrous and shining above, glaucous beneath. Petiole $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers $\frac{1}{4}$ in. across, straw-coloured turning to reddish-purple, in panicled cymes 1-3 in. long Drupe blackish-purple $\frac{1}{2}$ in. diam.

A small evergreen tree found, apparently wild, in Anjinaad Valley in N. Travancore, naturalised and well established both on the hills and in the low country in gardens and waste land elsewhere. Height 30 ft. Diam 8 in. Occurs in the dry region of Mysore, Coorg Coimbatore, the Neilgherries and a few other localities, but absent from Ceylon.

Flowers and fruits all the year round.

Gamble says that the bark is "dark-grey, nearly black, rough" "with short vertical cracks, inner substance dark red. Wood hard" "very close-grained and oily: sapwood white, scentless, heart-" "wood yellowish-brown, strongly scented. Annual rings distinctly" "marked by more numerous and slightly larger pores in the spring" "wood. Pores small, numerous, evently distributed. Medullary" "rays short, fine, numerous, uniform and equidistant" and he gives as an average.

W=60 lbs. P=876.

The Sandalwood tree gives the best scented wood when grown between 2,000 and 3,500 ft. elevation with a rainfall of from 20-50 inches, and it is generally admitted that the drier the climate the better the wood. Mysore is its natural home. The tree grows freely in the gardens of Travancore, even at sea-level, but the heartwood has no scent. The only places in the State where it would pay to grow the tree are the Anjinaud Valley (where a few Sandalwood reserves have already been selected) or the drier parts of the Cardamom Hills below 3500 ft. and on the Eastern slopes above Shencottah and Panagudi. An attempt was made about 20 years ago to grow Sandal by opening a plantation of about 50 acres near Quilon, but it was doomed to failure from the first, for the soil was unsuitable the elevation was low and the climate wet, and if the trees had grown they would have been scentless, so that the plantation was very

properly abandoned after a few years. It thrives best on a fairly deep red soil with or without stones, but as it cannot endure overhead shade or the drip from larger trees it will not grow in evergreen forests, neither will it thrive alone, but requires, the accompaniment of other trees or shrubs for the following reasons.

The Sandalwood tree is a root-parasite. Its seed germinates in the shade of some bush, and for a time the small plant obtains its nutriment direct from the soil, but in a few years its roots begin to attach themselves to the roots of other trees, shrubs or reeds by suckers (haustoria), and from that time probably the whole of the mineral constituents of the soil a e drawn from these other plants. If the plant on which it is feeding is killed, the Sandalwood tree loses all its leaves for a time but then makes a new root-connection with some other plant and revives. The number of species upon which the Sandal has been found to prey is considerable, and includes the *Casuarina*, *Lantana* and many common trees and shrubs.

Many attempts have been made in other countries to grow Sandal in plantations, in places where it is indigenous, but they have all failed, because the mistake was made of planting the tree alone, and keeping the ground free of weeds, so that the Sandal plants were unable to find any other plants on which to feed. According to M. Rama Rao (Ind. Forester xxx. 361-2,) the best way to raise this valuable tree is to allow the land to be cleared and cropped by villagers, and then to sow the Sandal seed among the bushes and weeds which spring up after abandonment. No clean weeding should be attempted, but if the grass and s rubs threaten to choke the small plants they may be cut back, so as to allow the Sandal free light and air.

Although in Travancore this tree never attains a height of more than 30 ft. or a girth above 2 ft. it has been observed to grow to a height of 60 ft and a girth of 6 ft in a climate more favourable to it. The rate of growth according to Gamble varies from 3·5 to 9·2 rings per inch of radius, and he quotes Lushington that an average increase of 8 inches girth in 10 years has been taken for Working Plans, so that at 40 years the girth would be 32 inches at 4½ ft. from the ground, and this would be the minimum size felled. Rama Rao's figures (Ind Forester xxx. 248) are not so favourable. He estimates the annual girth-increment at ·63 of an inch and calculates that it will take 57 years for a sandal to attain 36 inches. He states that the percentage of scented wood varies from 11-24 per cent. of the whole. Very few trees under 12 inches girth have any scented wood.

In Travancore the Sandal is a Royal tree, the property of the State wherever it grows, but the trees found growing in private gardens are of little value, as they have hardly any scent, hence the profit to Government by their sale is nil. The only sales of Sandalwood in Travancore are of trees cut in the Anjinad valley every few years, and the returns are insignificant.

When the 2nd edition of the manual of Indian Timbers was published (in 1902) its author stated that the average annual sales in Mysore amounted to 1841 tons ; to which should be added 102 tons

cut in Coorg, and about 75 in Madras so that the Indian outturn might be estimated at 2,000 tons per year valued at £ 40,000 Since that time the sales have steadily increased both in quantity and value, and in 1905-6 they reached a total in Mysore of 2466 tons. which fetched $12\frac{1}{2}$ lacs of rupees. The present outturn must therefore be about 2700 tons worth nearly £. 90,000 a year. The price per ton runs from 300-600 Rs. Of the total outturn about half is exported to China, Europe and the United States, and the other half is consumed in the country.

Sandalwood is used in India for the manufacture of boxes, cabinets and articles of furniture. A paste made from the wood is very much used by the higher castes, and from the roots and waste scraps a very valuable oil is extracted, which is used both in medicine and perfumery.

This valuable tree suffers from the attacks of many enemies Goats eat the leaves cattle and even human beings consume the bark and the stem is riddled by the borer of a moth *Zenzera coffeæ* During the last few years a terrible disease known as "spike" has attacked the Sandal tree over large areas in Mysore and Coorg. It is thus described by Butler in his report on the "Spike" disease. (Ind. For. xxix Appendix) ' From a certain moment all the new" "leaves produced, sometimes on a few isolated branches only," "sometimes over half the tree, sometimes even over the whole," "take on a new character, becoming narrow, pointed, stiff and" "crowded together. From this moment the affected shoot never" "ceases it growth, differing markedly from the normal tree, which" "lies dormant for a considerable portion of the year. The internodes" "become shortened and the new leaves smaller and narrower till" "they present the appearance of fine spikes bearing four rows of" "fine bristles." Further, the trees throw out an exessive number of branches and produce leaves in place of flowers The disease is not due to a fungus, but is caused by the excessive production of starch in all its tissues. At the same time the root-ends and haustoria die. To sum up, the same writer says "Spike is a" "nutritional disease characterised by a forced carbon-assimilation." "and a consequent train of modifications in the form of the tree." "It may be due to the circulation of a poison in the sap.' No remedy seems to have been found for the disease though the Mysore Government has offered a handsome reward for it. Fortunately, "Spike" does not appear to affect the value of the wood, though it kills the tree.

The Sandalwood of commerce is the product of various species of the genera *Santalum* and *Fusanus* which both belong to the order Santalaceæ. There are about 20 species of *Santalum* known, of which the most important is the Indian Tree. Other species occur in Tahiti, the Sandwhich Islands, Figi and New Caledonia. Several species of *Fusanus* are found in W. Australia. Before the Middle of the 18th Century, India was the only country which exported Sandalwood, but since its discovery in the islands of the Pacific, the largest quantities have been procured from thee. Owing to the unrestricted fellings carried on there the supply of Sandalwood

from the islands of the Pacific is said to be almost exhausted, so that the Sandal of India is likely to become more and more valuable as time goes on (See Ind. For xx. 322).

2. SCLEROPYRUM, Arn.

Trees with axillary spines and alternate, coriaceous leaves. Flowers polygamous, arranged in short axillary spikes. Perianth-tube in male flowers solid, in bisexual adnate to ovary, segments 5, stamens 5, opposite to perianth-segments, filaments bifid the anther cells on separate stalks. Ovary inferior. Fruit large indehiscent, containing one globose seed.

463 S. Wallichianum, Arn.; Fl. Br. Ind. v. 234; Bedd. Fl. Syl. t. 304 (under Pyrularia Wallichiana); Trimen Fl. Cey. iii. 475; Gamble Man. Tim. 588. Brandis Ind. Tr. 554.

Leaves 3-7 in. by $1\frac{1}{2}$ to 3 in. oblong-oval, acute or rounded at base, subacute, coriaceous, 3-nerved at base, glabrous, bright red when young. Petiole $\frac{1}{4}$ in. Spines straight, $\frac{1}{4}$ in. Flowers $\frac{1}{3}$ in. pinkish-red, male in catkin-like spikes 2 in. long, bisexual, in compact, cylindrical racemes. Fruit $1\frac{1}{2}$ in. long. pyriform, bright red, smooth, seed very hard.

A small tree found in the evergreen forests between 2,000 and 3,000 ft. but not common. Height 25 ft. Diam. 6 in. Occurs also on the Western Ghauts and in Ceylon and Burmah.

Flowers and fruits from Nov.-Feb.

Beddome says that it has a light-coloured, curiously grained wood.

ORDER LXV. EUPHORBIACEÆ.

Trees with alternate and simple leaves (rarely opposite or compound), usually stipulate. Flowers small and unisexual. Perianth usually simple and calycine, if double consisting of calyx and minute petals, sometimes entirely wanting in one or both sexes. Stamens 1, few or many, anthers 2-celled or 3-4 locellate. Ovary superior generally of 3 carpels more or less united, with 1 or 2 pendulous ovules in each cell. Fruit a 3-celled capsule or a drupe.

A very large Order containing no less than 58 trees indigenous in Travancore. Many of the species, trees, shrubs and herbs, found here as well as in other countries, are acrid and poisonous and contain much milky juice. Some yield starch, others oils or caoutchouc. The most important trees are *Excæcaria sebifera* the "Tallow" tree of China, *Buxus sempervirens* the "Boxwood" of Northern India and Europe, and *Aleurites moluccana* the "Belgaum Walnut". indigenous in the Malaya Archipelago. *Hevea Brasiliensis* the "Para rubber" *Manihot Glaziovii* the Ceara rubber and *Castilloa elastica* the "Mexican rubber" the last three all from S. America. Among shrubs the best known are *Ricinus communis* the "Castor oil plant",

Croton Tiglium the "Croton oil plant" and *Manihot utilissima* the "Tapioca".

Inflorescence consisting of a calyx-like involucre enclosing several male and one female flower, all without perianths ...1. *Euphorbia*.
Inflorescence of unisexual flowers with a single or double perianth.
Cells of ovary 2-ovuled.
Leaves trifoliolate ... ...2. *Bischofia*.
Leaves undivided.
Calyx-lobes valvate, petals scale-like.
Ovary 2-celled, fruit a drupe ... ...3. *Bridelia*.
Ovary 3-celled, fruit a capsule ... ...4. *Cleistanthus*.
Calyx-lobes imbricate.
Petals scale-like ... ...5. *Actephila*.
Petals none: male flowers in axillary racemes, spikes or panicles.
Fruit globose, seeds imbedded in an aril ...6. *Baccaurea*.
Fruit capsular, bursting irregularly ...7. *Aporosa*.
Fruit indehiscent, 1-2 seeded.
Petiole under ½ in. ... ...8. *Antidesma*.
Petiole over ½ in. ... ...9. *Daphniphyllum*
Petals none: male flowers solitary, in clusters or fascicles.
Style-arms much dilated.
Ovary 1-celled ... ...10. *Hemicyclia*
Ovary 2-4 celled ... ...11. *Cyclostemon*.
Styles and style-arms slender.
Disk absent in both sexes ... ...12. *Breynia*.
Disk present in female and often in male flowers.
Filaments free, round a large pistillode ...13. *Fluggea*.
Filaments free or united, pistillode absent ...14. *Phyllanthus*.
Styles connate into a fleshy mass, anthers 3 8, adnate to a central column ...15. *Glochidion*.
Cells of ovary 1-ovuled.
Petals present, inflorescence terminal ...16. *Croton*.
Petals present, inflorescence usually axillary.
Male sepals imbricate.
Petals united, fruit a drupe ... .. 17. *Givotia*.
Petals free, fruit capsular.
Female sepals not enlarged in fruit.
Staminal column with 3 anthers ... 18. *Trigonostemon*
Stamens 8-35 ... ...19 *Ostodes*.
Female sepals enlarged in fruit ...20. *Blachia*.
Male-calyx open in bud, 5-toothed ...21. *Dimorphocalyx*.
Male-sepals valvate ... ...22. *Agrostistachys*.
Petals absent, male-sepals imbricate ...23. *Gelonium*.
Petals absent, male sepals valvate.
Stamens 2 or 3, anthers 2-celled.
Male-calyx capsular, 2-3 lobed... —24. *Sapium*.
Male-calyx of 2-3 distinct sepals ..25. *Excœcaria*.
Stamens 4, anthers 2-celled.
Filaments slender ... ..26. *Adenochlæna*.
Filaments short, flat ... ...27 *Coelodepas*.
Stamens 6-many, anthers 2-celled.
Styles distinct, undivided ... ..28. *Mallotus*.
Styles united below in a column ..29. *Trewia*.
Stamens 1-many, anthers 3-4-celled.
Styles entire ... ...30. *Macaranga*.
Styles with 2 or 3 long arms... ...31. *Cladian*.

1. EUPHORBIA, Linn.

Soft-wooded trees with fleshy branches full of milky juice. Leaves of the stem alternate, without stipules or with stipular spines, those on the flowering branches opposite. Flowers monœcious, numerous, without a perianth many male and one female arranged in a common perianth-like involucre. Stamens 1 in each male flower. Ovary in female flowers 3-celled with one ovule in each cell, styles 3. free or connate. Fruit a capsule of 3 cocci.

Style simple, stigma capitate.
 Stem and branches round, without ribs or angles ..1. *E. Nivulia.*
 Branches with 5 spirally twisted ribs ..2. *E. neriifolia.*
Styles bifid at the apex ..3. *E. antiquorum.*

464 1. **E. Nivulia**, Ham; Fl. Br, Ind. v. 255: Bedd. Fl. Syl. ccxvi; Gamble Man. Tim, 590; Brandis Ind. Tr. 558.

Leaves 4-12 in. by $1\frac{1}{2}$-$3\frac{1}{2}$ in. tongue-shaped, mucronate, fleshy, tapering to the base, smooth, shining, glabrous; sharp stipular thorns in pairs spirally arranged on the stem and branches. Involucres 3 together in a short cyme, the 2 lateral peduncled, bisexual, the central sessile, male. Capsule $\frac{1}{4}$ in. broad, seeds smooth.

A deciduous bushy tree, with corky bark when old, found in waste places and on rocks in the drier part of the country. local. Height 3' ft Diam 8 in. Found through India, Pegu and Burmah in the drier tracts, absent from Ceylon.

Flowers and fruits at all times.

The wood has not been examined. The juice is acrid and purgative.

465 2. **E. neriifolia**, Linn; Fl. Br. Ind. v. 255; Bedd. Fl. Syl ccxvi; Gamble Man. Tim, 591; Brandis Ind. Tr. 558.

Leaves 3-12 in. by $1\frac{1}{2}$-$4\frac{1}{2}$ in. cuneate or oblanceolate, usually mucronate, fleshy, waved, narrowed into a very short petiole; stipular thorns solitary or in pairs, about $\frac{1}{2}$ in. long. Cymes subsessile in the upper axils, involucres yellowish, 1-3 headed, bracteoles fimbriate. Capsule $\frac{1}{2}$ in. broad, deeply 3-lobed.

A fleshy deciduous tree with 5-angled branches, occuring in the evergreen forests on rocks up to 3000 ft. Height 20 ft. Diam 10 in. Also found in the Deccan Peninsula and on the West Coast, always on rocky places,

Gamble says that the 'bsrk is reticulated Pith large, round." "Wood white, soft, even-grained. Pores small, very scanty, usually "in pairs. Medullary rays extremely fine and numerous" and he gives.

W=26 lbs.

It has an acrid juice which is used in medicine as a purgative, and as an antidote in snake-poisoning (Dict. Econ. Prod.)

466 3. **E. antiquorum**, Linn; Fl. Br. Ind. v, 255; Bedd. Fl. Syl ccxvi; Trimen Fl. Cey. iv. 4; Gamble Man. Tim. 590; Brandis Ind. Tr. 558. Tam. and Mal. *Kalli*.

Leaves $\frac{1}{4}$-$\frac{1}{2}$ in. cuneate, truncate. glabrous, fleshy, soon falling; stipulary spines $\frac{1}{4}$ in long, sharp, persistent. Involucres in small cymes of 3, the central sessile, the others on long, stout pedicels. Flowers greenish yellow, male generally 5 or 6 to one female. Capsule deeply 3-lobed.

A fleshy, deciduous tree with green, jointed branches on which are 3 wide wings narrowed to the joints and coarsely crenate, common on dry rocks in S. Travancore and used as a hedge plant. Height 25 ft. Diam 1 ft. Common throughout India and Ceylon.

Flowers and fruits all the year.

Bark very rough, brown. The wood has not been examined. "The whole plant affords a very viscous, acrid milky juice" (Trimen). When taken internally it acts as a drastic purgative. (Dict: Econ: Prod) Besides the above, *E. Tirucalli* the "Milk hedge" a native of Africa, often used in the drier parts of the country as a hedge plant because cattle will not eat it, is commonly seen in the low country. It is unarmed, and has fleshy, cylindrical, green branches, and sessile leaves $\frac{1}{2}$ in. long.

2. BISCHOFIA, Blume.

A tree with alternate, trifoliolate leaves. Flowers dioecious, apetalous in ample pedunculate panicles, axillary or above the scars of fallen leaves. Sepals 5. Stamens 5, opposite the sepals. Ovary 3-4 celled, with 2 ovules in each cell. styles entire. Fruit fleshy.

B. javanica, Blume; Fl. Br. Ind. v. 345; Bedd. Fl. Syl. t. 259; 467
Gamble Man. Tim. 607;, Brandis Ind. Tr. 558. Tam. *Nalachithiyan nannal*. Mal. *Thirippu: nira*.

Leaflets 3-8 in. by $2\frac{1}{2}$-5 in. ovate, crenate, acuminate, glabrous shining, petiolules $\frac{1}{2}$-$\frac{3}{4}$ in. Common petiole 3-8 in. Flowers yellowish-green, very small. Drupe $\frac{1}{3}$ in. diam. globose or somewhat flattened, fleshy brown, containing 3-6 smooth seeds.

A very lofty tree common in evergreen forests from 1000-5000 ft, chiefly remarkable for its vitality and power of throwing out new shoots from the stump after the tree has been felled and scorched by fire. Height 100 ft. Diam. 5 ft. Also found on the Western Ghauts, Neilgherries, Assam and Malaya, but not in Ceylon.

Flowers Feb.-March. Fruit Oct.-Jan.

Bark rough, brown $\frac{1}{4}$ in. thick. Sapwood pale red. Heart wood dark claret-red, smooth, straight-grained, even and moderately hard. Pores medium-sized to large, often in short radial lines. Rays of two classes, fine and close together and broad and distant. Annual rings marked by dark lines 7 to inch.

W=52 lbs P=745.

The wood is good and is often used by the planters for planking for ceilings and other building purposes. In Assam it is used for bridges and works of construction. Gamble, quoting from the Timber Trades Journal, says that "although above ground it warps and"

"cracks and white ants attack it, in wet ground or under water "it is almost imperishable, so that it is particulary suited for pile-foundations and railway-sleepers.". It is an excellent fuel.

3. BRIDELIA, Willd.

Trees with alternate, short petioled leaves with parallel nerves. Flowers small, monoecious or dioecious in axillary or terminal spikes, with numerous bracteoles. Calyx segments 5, valvate. Petals 5, small. Disk conspicuous. Stamens in male flower 5, united below, distinct and spreading above. Ovary in female flower 2-celled with 2 ovules in each cell, style forked. Fruit a drupe.

468 **B. retusa, Spreng**; Fl. Br. Ind. v. 267; Bedd. Fl. Syt. t 260; Trimen Fl. Cey. iv. 10; Gamble Man. Tim 595. Tam. *Mulla vengei; mullu marthu, asavei, kaduga.* Mal. ***Mukkayini.***

Leaves 3-6 in. by 2¼-4 in. ovate, obtuse or rounded at apex and base entire, glabrous, with 15-25 pairs of parallel nerves. Petiole ¼ in. stipules lanceolate. Flowers green tinged with red, $\frac{1}{6}$ in across in spikes 2-4 in. long. Drupe fleshy, globose, $\frac{1}{3}$ in. purplish-black, seated on the persistent calyx.

A large tree, generally thorny when young, common in deciduous forest from sea-level to 4000 ft. Height 70 ft. Diam 2 ft. Found through India, Burmah and Ceylon.

Flowers June-Sept. Fruits Nov.-Jan.

Bark brown $\frac{2}{3}$ in. thick. Wood pale brown, smooth but often flawed by black knots, hard, polishes and seasons well. Pores of medium size, scanty, often in short radial lines. Rays numerous, moderately broad, visible on a radial section as a silver-grain. Annual rings marked by dark concentric lines, 5-6 rings per inch.

W=61 lbs. P=548.

This is one of the reserved woods and is sometimes in demand, but it is not often used in Travancore. Gamble says that "the" "wood is of good quality and colour, can be cut with a pretty grain" "and is durable, it is used for cattle-yokes, agricultural implements," "carts and building. It stands well under water. The bark is" "used for tanning, the fruit eaten and the leaves cut to feed cattle."

4. CLEISTANTHUS, Hook.

Small trees with alternate, entire leaves. Flowers in axillary clusters or spikes, monoecious. Calyx-segments 4-6, valvate. Petals very small, often bifid. Stamens in male flowers 5, more or less connate below into a column. Ovary in female flowers 3-celled with 2 ovules in each cell, styles 3, bifid. Fruit dry, 3-lobed.

Branches and petiole densely villous. Leaves rusty-pubescent beneath . 1. *C. malabaricus.*

Branches and petiole glabrous. Leaves glabrous beneath . 2. *C. patulus.*

1. **C. malabaricus,** Muell ; Arg.; Fl. Br. Ind. v. 274 ; Bedd. Fl. Syl. coiii ; Gamble Man. Tim. 597 ; Brandis Ind. Tr. 561. 469

Leaves 3-6 in. by 1-1½ in. oblanceolate, acuminate, base acute, sparsely hairy above, rusty-pubescent beneath. Petiole ⅛ in. densely villous ; stipules ¼ in. linear. Flowers ¼ in. few. in axillary clusters, sepals and petals narrow. Capsule globose ⅓ in. diam. deeply 3-lobed, hairy. seeds oblong, 3 cornered, rugose.

A small tree of the evergreen forest between 1000 and 3000 ft. Height 25 ft- Diam. 8 in. Found also in the Konkan and N. Kanara.

Flowers and fruits April-June.

Nothing is known of the timber.

2. **C. patulus,** Muell. Arg ; Fl. Br. Ind. v. 279 ; Bedd. Fl, Syl. ccii ; Trimen Fl. Bey. iv. 13 ; Gamble Man. Tim. 598 ; Brandis Ind. Tr. 561. 470

Leaves 3-4 in. by 1-1½ in. ovate to lanceolate, acuminate or caudate, base acute or rounded, glabrous. Petiole ¼ in. Flowers yellow, ⅓ in. male and female mixed in axillary heads, sepals acute, petals orbicular, clawed, ovary hirsute. Capsule ⅓ in. broad and long, dark brown, quite smooth, seeds ⅙ in. long, obovoid.

An elegant little tree not uncommon dry subalpine jungles on both sides of the Presidency (Beddome) and found by Wight near Courtallam. I therefore include it though I do not known the tree It occurs also in Ceylon. Gamble says that the "bark is thin, light." "papery. Wood reddish brown, hard, close-grained. Pores small,". "in radial strings of 3-6 between the fine. numerous and equidistant" "medullary rays," and he gives.

W = 52 lbs.

Beddome says that the wood is exceedingly hard and durable.

5. ACTEPHILA, Bl.

Small tree with alternate, entire leaves, and minute, deciduous stipules. Flowers monœcious or diœcious, male in axillary clusters. female solitary. Sepals 5-6, imbricate, Petals scale-like, disk broad. Stamens 3-6, free or connate at the base ovary 2-celled with 2 ovules in each. Fruit a hard capsule.

A. excelsa, Muell. Arg ; Fl. Br. Ind. v. 282 ; Bedd. Fl. Syl. clxxxix. Trimen Fl. Cey. iv. 14 (under *A. neilgherrensis*) ; Gamble Man. Tim. 598 ; Brandis Ind. Tr. 561. 471

Leaves 3-8 in. by 1-2½ in. very variable, oblong-lanceolate, obovate or oval, base acute, glabrous or minutely puberulous. Petiole ¼-1¼ in. Flowers small, pale green. Calyx-segments oval, obtuse. Petals wedge-shaped, often bifid. Ovary depressed-globose, styles short, bifid. Capsule 1 in. diam. glabrous.

A small tree found in our evergreen forests up to 6000 ft. Height 25 ft. Diam. 8 in. Occurs also on the Neilgherries. Western Ghauts, Assam and Ceylon.

Flowers Sep.-Dec. Fruits May-Jue.

The wood is unknown.

6. BACCAUREA, Lour.

Small trees with alternate, entire leaves and double stipules. Flowers in simple or compound racemes, diœcious, apetalous. Male flowers minute with 4-5 imbricate sepals and 4-8 stamens. Female flowers much larger, with 4-6 sepals and a 2 5-celled ovary, with 2 ovules in each cell. Fruit globose, seeds embedded in a fleshy arillus.

B. courtallensis, Muell Arg; Fl. Br. Ind. v. 367; Bedd. Fl. Syl. t. 280 (under *B. sapida*); Gamble Man. Tim. 611; Brandis Ind. Tr. 563 Mal. *Múttothiri*; *múttakai*; *púvei*.

Leaves 3-7 in. by $1\frac{1}{2}$-3 in. oblanceolate, obtusely acuminate, base acute, glabrous. Petiole 1-$1\frac{1}{2}$ in. Flowers dark crimson, male 1/15 in. across, in racemes 4-6 in. long from the branches or stem. Female $\frac{1}{8}$ in. across in racemes 6-8 in. growing in dense masses on the stem. Fruit bright crimson sub-globose with 3 ridges, 1-$1\frac{1}{2}$ in. diam. hanging in clusters from the lower part of the stem.

A small evergreen tree common at elevation from 0-3000 ft. in the moist forest. Height 25 ft. Diam. 8 in. Found also on the Westerd Ghauts from N. Kanara southwards.

Flowers Feb.-March. Fruits May-June.

Bark pale brown, rough, $\frac{1}{6}$ in. thick. Wood yellowish-white, clean, even and straight-grained with shining plates on a longitudinal section, moderately hard. Pores small, scanty, often divided or in radial strings.

W=42 lbs. P=569.

The fruit is edible, but extremely acid.

7. APOROSA, Blume.

Trees with alternate, entire leaves and small deciduous stipules. Flowers small, diœcious and apetalous; made in axillary catkin-like spikes in the axils of large imbricating bracts, sepals 3-6, stamens 1-5; female in short spikes or racemes, peduncles clothed with imbricating bracts, sepals 3-6, small. Ovary 2-celled with 2 ovules each cell. Fruit capsular, bursting irregularly.

Fruit ovoid or globose, glabrous,
    Female flowers sessile . . . 1. *A acuminata*.
    Female flowers pedicelled . . . 2. *A Lindleyana*.
Fruit ovoid, covered with long bristles . . . 3. *A Bourdilloni*.
Fruit fusiform and glabrous . . . 4. *A fusiformis*.

473 1. **A. acuminata**, Thw; Fl. Br. Ind. v. 348; Bedd. Fl. Syl. cxcix. Trimen Fl. Cey. iv. 41; Gamble Man. Tim. 608; Brandis Ind. Tr. 563. Mal. *Nirvetti*.

Leaves 2-4 in. by $\frac{1}{2}$-$1\frac{1}{4}$ in. lanceolate, acute at base, caudate-acuminate, acute, glabrous. Petiole $\frac{1}{4}$ in. Flowers greenish-yellow, very small; male in short spike under $\frac{3}{4}$ in; female flowers sessile, solitary, ovary silky-hairy, stigmas bifid, spreading. Fruit $\frac{2}{3}$ in. long, ovoid, pericarp hard, smooth, red, dehiscing irregularly, containing 3 seeds in a reddish, pulpy covering.

A small tree common in the evergreen forests from 0-2000 ft. Height 20 ft. Diam. 8 in. Found also in Tinnevelly and Ceylon

Flowers in Jan.-Feb. Fruits in May-June.

The properties of the tree or its timber are unknown.

2. **A. Lindleyana**, Paill; Fl. Br. Ind. v. 349; Bedd. Fl. Syl. t. 286; Trimen Fl. Cey. iv. 40; Gamble Man. Tim. 608; Brandis Ind. Tr. 564. Tam. *Vittil*, Mal. *Vetti*. 474

Leaves 3-6 in. by $1\frac{3}{4}$-2 in. ovate-oval, rounded at base, slightly acuminate, undulate, glabrous and shining. Petiole $\frac{1}{2}$ in. Stipules acute, male flowers small, sessile, yellow. in spikes $\frac{1}{2}$-2 in. long, 1-4 together. Female flowers on short pedicels 3-8 together, pale green, ovary flask-shaped, hairy. Style with 3 large, recurved stigmas. Fruit $\frac{1}{2}$ in. diam. globose, glabrous, pericarp thin, containing a single brown seed in a yellow pulpy covering.

Ordinarily a much branch tree of the evergreen forest, 30 ft. high and 10 in thick, but sometimes attaining a height of 60 ft. and a diameter of $1\frac{1}{2}$ ft. Very common up to 3000 ft. Occurs also on the Western Ghats from Kanara southwards, in Sikkim and Ceylon.

Flowers Jan.-Feb. Fruits April-May.

Bark brown, smooth, Wood brown, rough, very hard, often flawed. Pores medium-sized, scanty, in short radial lines. Rays fine, numerous.

W=38 lbs. P=515.

Beddome says that the wood is in use for building and other purposes, but it is not used in Travancore except for fuel. The fruit is pleasantly acid and is edible.

3. **A. Bourdilloni**, Stapf; Brandis Ind. Tr. 564; Mal. *Malam vetti*. 475

Leaves 4-6 in. by 1-$1\frac{3}{4}$ in. oblong-elliptic, obtusely acuminate, base rounded, undulate coriaceous glabrous except on the 7-9 pairs of secondary nerves, stipules falcate, tomentose. Petiole $\frac{1}{2}$ in. Male flowers greenish-white in short spikes $\frac{3}{4}$ in. long. in the axils of present or old leaves, stamens 2 or 3, bracts numerous. Female flowers solitary on $\frac{1}{3}$ in. peduncles, ovary hairy, stigmas deeply bifid. Fruit 1 in long, ovoid, covered with long bristles.

A small tree attaining a height of 25 ft. and a diam of 6 in. common as an under-tree in the evergreen forest of the Idiyara Valley and the Periyar. Endemic.

Flowers Dec.-Feb. Fruits Feb. April.

Nothing is known of this tree or its uses.

4. **A. fusiformis**, Thw; Fl. Br. Ind. v. 351; Bedd Fl. Syl. cxcix; Trimen Fl. Cey. iv. 41. 476

Leaves $2\frac{1}{2}$-5 in. by $1\frac{3}{4}$-3 in. obovate or rotundate, acute or rounded at base, obtuse, glabrous, thick and coriaceous. Petiole $\frac{1}{4}$ in. Male flowers sessile, yellowish. in spikes $\frac{3}{4}$-1 in. long, stamens 2-3, bracts rounded. Female flowers 2-6 in. a cluster, ovary glabrous, stigmas 2-3-fid. Fruit glabrous. fusiform $\frac{3}{4}$ in. long, pericarp rather thin.

A small tree observed by me in the evergreen forest from 2000-3000 ft. rare. Height 30 ft. Diam. 8 in. Hitherto only found in Ceylon and supposed to be endemic there.

Flowers in March-April. Fruits in May-June.

The timber is unknown.

8. ANTIDESMA, Linn.

Trees with alternate, entire leaves, stipules usually persistent. Flowers very small, diœcious and apetalous. Calyx segments 3-7s imbricate, stamens in male flowers 3-5. disk in female flower, annular or pulvinate. ovary 1-celled with 2 ovules in each cell. stigmas 2-4. Fruit a drupe, juicy, crowned with persistent stigmas.

Lower sides of leaves and ovary tomentose . 1. *A. Ghæsembilla.*
Lower sides of leaves and ovary glabrous.
Male flowers sessile.
Leaves over 4 in. long . 2. *A. Bunius.*
Leaves under 3 in. long . 3. *A. zeylanicum.*
Male flowers pedicelled.
Leaves under 3 in. long ; inflorescence glabrous. 4. *A. diandrum.*
Leaves over 4 in. long ; inflorescence velvety: 5. *A. Menasu.*

477 1 A. **Ghaesembila**, Gærtn ; Fl. Br. Ind, v. 357; Bedd. Fl. Syl. cc ; Trimen Fl. Cey. iv. 43 ; Gamble Man. Tim. 610 : Brandis Ind. Tr. 564.

Leaves $1\frac{1}{2}$-4 in. by 1-3 in oblong-orbicular, rounded at base and apex, glabrous above, densely pubescent beneath. Petiole $\frac{1}{4}$-$\frac{1}{3}$ in. Flowers reddish, sessile, in short, tomentose, panicled spikes. calyx of male flowers pubescent. Stamens 5, ovary of female flower pubescent. Fruit 1/5 in globose, smooth, reddish-purple.

A small tree common on the banks of the Periyar at Malayattur, and elsewhere in the evergreen forest at low elevations. Height 30 ft. Diam. 8 in. Found also through N. and S. India, Ceylon and Burmah.

Flowers and fruits Feb. to May.

Gamble says that the "bark is grey or pale brown $\frac{1}{6}$ in. thick" "with a few deciduous scales. Wood red with darker coloured" "heartwood, smooth, hard, close and even-grained. Annual rings" "indistinctly marked by concentric lines, Pores small and moderate-" "sized. uniformly distributed. Medullary rays of two sizes, few" "moderately broad rays with numerous fine rays between them, pro-" "minent in the silver-grain," and he gives.

W=49 lbs. (average)

The wood is not used in Travancore but the leaves and fruit are eaten.

2. A. **Bunius**, Spr. ; Fl. Br. Ind. v. 358 ; Bedd. Fl. Syl, cc ; Trimen Fl. Cey. iv. 43 ; Gamble Man. Tim 610 ; Brandis Ind. Tr. 564

Leaves 4-6 in. by $1\frac{1}{2}$-2 in lanceolate, tapering to base, acuminate, glabrous and shining, coriaceous, stipules narrow, hairy. Petiole $\frac{1}{8}$ in. Flowers reddish, male sessile in spikes 1-3 in. long, calyx tomentose, segments 3, shallow, stamens 3, exserted. Female flowers slightly stalked, ovary glabrous, stigmas 3, large spreading. Fruit $\frac{1}{3}$ in ovoid, smooth, very juicy, black when ripe.

A small evergreen tree common up to 2000 ft. in the moist forests. Height 25 ft. Diam. 6 in. Occurs also in Assam, the Western Ghauts, Ceylon and Burmah.

Flowers April-May. Fruits May-June.

Bark greyish-brown. Wood red, hard, in appearance similar to that of A. *Ghæsembilla.*

W=46 lbs. (Gamble)

The leaves and fruit are eaten.

3. **A. zeylanicum.** Lam.; Fl. Br. Ind. v. 359 (*under A. Alexiteria*) Bedd. Fl Syl. cc; Trimen Fl. Cey. iv. 44: Gamble Man. Tim, 610; Brandis Ind. Tr. 565. 479

Leaves 1-3 in. by $\frac{1}{2}$-$1\frac{1}{4}$ in. oval, acute at base, acuminate, glabrous and shining rather thin. Petiole 1/12 in. Flowers green in slender spikes about 1 in. long. Male flowers sessile, calyx segments 3-4, stamens 3. Female flowers; ovary flask-shaped. glabrous, styles 2 or 3, recurved. Fruit $\frac{1}{6}$ in. ovoid, red.

A small tree of the evergreen forests at low elevations. Height 25 ft. Diam. 6 in. Occurs also on the Western Ghauts and in Ceylon.

Flowers and Fruits April to June.

Uses unknown.

4 **A. diandrum,** Roth; Fl. Br. Ind. v. 361; Bedd. Fl. Syl. cci; Trimen Fl. Cey. iv. 44; Gamble Man Tim. 610; Brandis Ind. Tr. 565. 480

Leaves 1-3 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. linear to oval acute at base, acuminate, glabrous, stipules linear, caducous, Petiole 1/10 in. Flowers greenish in short, lax, glabrous racemes. Male flowers pedicelled, calyx-segments 4, shallow, stamens 2 rarely 3. In female flowers calyx-segments more deeply divided, styles 2, deeply bifid, Fruit $\frac{3}{8}$ in. ovoid, juicy, smooth, dark purple.

A small tree common in the low country in evergreen forest. Height 20 ft. Diam. 6 in. Found throughout India, Ceylon and Burmah.

Flowers and fruits April-June.

"Bark smooth, grey, inner bark pale red, fibrous, Wood pin-" "kish-grey, hard, close grained. Pores small and very small. uni-" "formly distributed. Medullary rays of two sizes, moderately broad" "and very fine, wavy, annual rings marked by a fine line."

W=41 lbs.

"The bright green leaves which turn red before falling, are" "pleasantly acid and edible, as are the fruits." (Gamble).

481 5. **A. Menasu**, Miquel; Fl. Br. Ind. v. 364; Gamble Man. Tim. 610; Brandis Ind. Tr. 565; Mal. *Puthara vál.*

Leaves 4-8 in. by 1-3 in. elliptic-oblong, acuminate, base rounded or acute, glabrous and shining on both sides, veins prominent beneath, stipules narrow, caducous. Petiole $\frac{1}{8}$-$\frac{1}{4}$ in. Flowers greenish in compound, pubescent racemes 2-3 in. long. Male flowers pedicelled, calyx 3-4 partite, stamens 3 or 4. In female flowers ovary glabrous, stigmas short. Fruit ovoid, acute, $\frac{1}{4}$ in. long, purple.

A small tree with a much branched stem common in the evergreen forests between sea level and 4000 ft. Height 20 ft. Diam. 8 in. Found also on the Neilgherries and other hills of S. India.

Flowers April-June. Fruits in December.

"The fruit is eaten; it is of a red colour, Wood darkish-red," "similar to that of *A. Ghæsembilla*, but the pores smaller and the" "medullary rays finer. Weight 52 lbs. per c. ft." (Dict. Econ. Prod.)

9. DAPHNIPHYLLUM, Blume.

Trees with alternate, entire, glabrous, long-petioled leaves crowded about the ends of the branches, stipules none. Flowers diœcious, apetalous, in axillary racemes. Sepals minute, 5-8, more or less connate Stamens in male flowers 5-8 with very large anthers. Ovary in female flowers imperfectly 2-celled with 2 ovules in each cell, stigmas recurved, undivided. Fruit an ovoid drupe containing a single seed.

482 **D. glaucescens**, Blume; Fl. Br. Ind. v. 353; Bedd. Fl. Syl. t. 288 (under *D. Roxburghii*); Trimen Fl. Cey. iv. 42; Gamble Man. Tim. 609. Brandis Ind. Tr. 566.

Leaves 2-4 in. by $\frac{3}{4}$-1 in. obovate-oblong, tapering to base, rounded at apex, pale green when young, glabrous, glaucous beneath. Petiole red $\frac{1}{2}$-1 in. Flowers yellowish-green on long pedicels, in short racemes from axils of lower leaves, sepals obtuse, filaments very short anthers erect. Drupe ovoid, glabrous, greenish-red, $\frac{1}{3}$ in. long, tipped with style-base.

A medium-sized tree common at the edges of sholas at elevations above 4000 ft. Height 50 ft. Diam. 1 ft. Found on the Neilgherries and other hills of S. India and in Ceylon.

Flowers Jan.-March. Fruits April-June.

"Bark brown, somewhat corky, $\frac{1}{8}$ in. thick, inner layer black." "Wood grey, even-grained. Pores very small numerous. Medul-" "lary rays fine, numerous, the distance between them equal to the" "transverse diameter of the pores." (Gamble).

W=40 lbs

The timber is not used except for fuel.

10. HEMICYCLIA, Wt. and Arn.

Trees with alternate usually entire, sometimes dentate leaves, base unequal. Flowers small, diœcious, apetalous, pedicelled, sepals 4-5, imbricate inner usually larger. Male flowers clustered in the axils, stamens 4-23, inserted round an orbicular disk, filaments free. Female flowers solitary, disk flat, annular, ovary obliquely ovoid, 1-(rarely 2-) celled, with 2 ovules in each cell stigma sessile. Fruit with a hard endocarp, seeds grooved on one face.

Leaves quite entire
Leaves less than 3 in. fruiting pedicels not exceeding 1 in. ... 1. *H. venusta*
Leaves more than 4 in. fruiting pedicels 1½ to 2 in. ... 2. *H. elata.*
Leaves dentate ... 3 *H. travancorica.*

1. **H. venusta,** Thw.; Fl. Br. Ind. v. 339; Bedd. Fl. Syl. cxviii; Gamble Man. Tim. 606; Brandis Ind. Tr. 566. Tam. *Vellalambu: palla kanni.* Mal. *Vella kasavu.* 483

Leaves 3-5 in. by 1-1½ in. elliptic-oblong, obtuse or acuminate, base acute, often oblique, very coriaceous, glabrous and shining above, quite entire, very pale when young, dark green when mature. Petiole ⅙ in. Flowers pale yellow, ¼ in. diam. finely tomentose; male in clusters, pedicels ¼-1 in. stamens generally 8: female solitary or few, pedicels ⅓ in. stigma disciform. Fruit obovid ¾ in. long, fruiting pedicel ¾ in.

A handsome thick-foliaged tree of medium size size common in evergreen forest from 2000 ft. upwards, especially on the Cardamom Hills. Height 40 ft. Diam. 1½ ft. Found also on the Western Ghauts from Kanara southwards and in Tinnevelly.

Flowers Feb.-April, Fruits May-July.

Stem fluted, bark white, smooth, thin. Wood pale grey, hard, close-and even-grained. Pores small, numerous, often divided or in radial strings. Rays fine, very numerous, with alternate bands of light and dark tissue.

W=51 lbs. P=726.

Small trees are sometimes used for posts in rough buildings, but the wood cracks a great deal and is not durable. Small plants make excellent walking sticks.

2. **H. elata,** Bedd; Fl. Br. Ind. v. 339; Bedd. Fl. Syl. t. 279; Gamble Man. Tim. 605; Brandis Ind. Tr. 566. 484

Leaves 4-5 in. by 1½-2 in. lanceolate, acuminate, quite entire, glabrous and shining on both surfaces. Petiole ½ in. Flowers ⅓ in. across, greenish-yellow; male flowers in clusters of 4-5 on pedicels ½-1 in. stamens 8-12; female solitary or few, pedicels ¾ in. disk annular, stigma disciform. Fruit ovoid ¾-1 in. long, fruiting-pedicels 1½-2 in.

A very lofty tree of the evergreen forests about 2000 ft. only seen

by me near Ponmudi, rare. Height 100 ft. Diam, 2 ft. Occurs also on the Western Ghauts and in Tinnevelly from 2000-4000 ft.

Flowers Feb.—April. Fruits May—July.

Beddome says that it has a strong wood, much used for building.

485 3. **H. travancorica**, sp. nova; Gamble Man. Tim. 605 (under *H. lanceolata*) Brandis Ind. Tr. 567. Tam. *Vellei pillei*.

Leaves $1\frac{1}{2}$-3 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. ovate-lanceolate, acuminate, dentate, glabrous. Petiole $\frac{1}{4}$ in. Male flowers pale yellow $\frac{1}{6}$ in. across, borne in clusters on the old wood or in leaf-axils, stamens 8-12. Female flowers not seen. Fruit ovoid bright red, glabrous, $\frac{1}{2}$ in. long, sessile.

A graceful tree of medium size common in the evergreen forests near Arienkavu at 1000 ft. but not observed elsewhere. Height 60 ft. Diam. $1\frac{1}{2}$ ft. Endemic.

Flowers March—April. Fruits May—June.

Bark pale brown, smooth. Wood greyish-white, smooth, liable to crack, hard and close-grained. Pores few, very small. Rays very fine and very numerous, not prominent. Alternate bands of light and dark wood close together may indicate the annual rings.

W=55 lbs P=527.

The wood is not used except for fuel.

11. CYCLOSTEMON. Blume.

Trees with alternate entire or distantly serrate leaves, base unequal. Flowers diœcious, apetalous, axillary or on the old wood, sepals 4-6, much imbricate; male flowers:—stamens few or many arranged round a wide disk, female flowers:—disk, flat, annular, ovary globose 2-celled with 2 ovules in each cell, style very short, stigmas 2, large, flat. Fruit fleshy, indehiscent, 2-celled, containing 1 seed in each cell.

Branchlets pedicels and flowers glabrous or slightly pubescent . 1. *C. macrophyllus*.
Branchlets, pedicels and flowers covered with golden tomentum . 2. *C. malabaricus*.

486 1. **C. macrophyllus**, Blume; Fl. Br. Ind. v, 340: Bedd. Fl. Syl. t. 278; Trimen Fl. Cey. iv. 38; Gamble Man. Tim. 607; Brandis Ind. Tr. 567. Mal. *Mali payin*.

Leaves 3-9 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in. oblong-lanceolate, acute, shallowly serrate, veins 5-8 pair, conspicuous beneath, coriaceous, glabrous: stipules subulate. Petiole $\frac{1}{4}$ in. Flowers $\frac{3}{4}$ in. across, pale yellow in tomentose pedicels, sepals 4-5, rounded, concave, finely tomentose outside, disk in male flower pubescent, stamens 30-40. ovary of female flower pubescent, stigma black: male flowers fascicled on the old wood, female solitary on the branches and in leaf-axils. Fruit rough, yellow and fleshy $1\frac{1}{2}$ in. long and 2 in. wide slightly bi-lobed, seeds 1 in. long by $\frac{1}{2}$ in. thick.

A large tree with a fluted stem, and a wide spreading horizontal branches, common in the evergreen forests at low elevations, at

Kulathupuzha and elsewhere. Height 80 ft. Diam $2\frac{1}{2}$ ft. Found also on the We-tern Ghauts, the Anamallay, Ceylon and the Malay Peninsula

Flowers Dec,—February Fruit May—June.

Bark greyish-brown, smooth, $\frac{1}{2}$ in. thick. Wood hard. dull, greyish-yellow, smooth, inclined to crack. Pores of medium size scanty. often divided, arranged in radial lines. Rays fine, uniform wavy and close-packed. and between the rays are alternate bands of loose and firm tissue forming cross-bars.

W=55 lbs.

The wood is not used. The pulp is very bitter and said to be poisonous.

2. **C. malabaricus**; Bedd, Fl. Br. Ind. v. 341; Bedd. Fl. Syl. excix; Gamble Man. Tim. 606, Brandis Ind. Tr. 567. 487

Leaves 4-9 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in. oblong, suddenly acuminate, glabrous above, pilose beneath on the costa and veins, distantly serrate, veins prominent 7-10 pair. Petiole $\frac{1}{4}$ in. Flowers $\frac{1}{2}$ in. across, reddish-yellow on tomentose pedicels, sepals 4-5, broad, covered outside with golden tomentum. Stamens about 40 round a tomentose disk, ovary in female flower aureo-tomentose. Fruit 1 in. by $\frac{3}{4}$ in. slightly bi-lobed, densely tomentose, and crowned by 2 reniform stigmas.

A tree of medium size replacing the last named at the higher elevations, common in the evergreen forests at the sources of the Acchankoil-Kallaur river and on Muthukuli Vayal above 3000 ft.

Flowers Dec.—Feb. Fruits March—June.

The wood is uuknown

12. BREYNIA, Forst.

Small trees with spreading branches and alternate, entire, stipulate leaves. Flowers very small, apetalous, axillary, monœcious. Calyx male flowers 6-lobed, stamens 3, filaments connate in a central column, pistillode absent. Calyx in female flowers more deeply 6 lobed, ovary 3-celled with 2 ovules in each cell, styles 3, slender, bifid or stigmas 3. Disk none in either sex. Fruit more or less succulent, globose, containing 6 seeds.

B. rhamnoides, Muell, Arg. Fl. Br. Ind. v. 330. Bedd. Fl. Syl. cxcvi. Trimen Fl. Cey. iv. 33. Gamble Man. Tim. 604. Brandis ind. Tr. 568. 488

Leaves 1-$1\frac{1}{2}$ in. by $\frac{1}{2}$-1 in. oval, acute at both ends, glabrous. thin. pale beneath. Petiole 1/10 in. Stipules minute, subulate. Flowers yellow on slender pedicels, male very small, in clusters, female solitary. Fruit globose $\frac{1}{4}$ in. diam. smooth. dull, red, seated on the slightly enlarged calyx.

A small tree of the open scrub forest up to 3000 ft. Height 20 ft. Diam. 6 in. Widely distributed through India, Ceylon, Burmah and China-

Flowers and fruits July—Aug.

'Gamble says that the bark is "greyish-brown, rough. Wood reddish-brown, hard, close-grained. Pores small, evenly distributed. Medullary rays fine, numerous."

The wood is not used-

13.* FLUGGEA, Willd.

Small trees with alternate, entire, distichous leaves, Flowers diœcious, apetalous on slender pedicels, male in dense clusters. female in lax fascicles Sepals 5, distinct, imbricate Stamens and disk-glands 3-5, filaments free round a large pistillode. Disk annular, ovary 3-celled, with 2 ovules in each cell, styles long, recurved, bifid. Fruit a small globose berry with 6 seeds.

489 **F. microcarpa**, Blume; Fl. Br. Ind. v. 328; Bedd. Fl. Syl. cxcvii (under *Securinega oborata*); Gamble Man. Tim. 603; Brandis Ind. Tr. 569.

Leaves 1-3 in by $\frac{1}{2}$-$1\frac{1}{2}$ in. very variable in shape, obtuse, or acute, thin, glabrous Petiole $\frac{1}{4}$ in. slender. Flowers very small. Fruit white, $\frac{1}{6}$-$\frac{1}{3}$ in fleshy, containing 3-3 three-cornered seeds.

A small, unarmed deciduous tree said to occur in Travancore though I do not know it. Beddome says that it is a shrub on the plains and a tree in the mountains. Found through India, Assam, and China.

Gamble says that the bark is "smooth, thin, rusty or reddish-" "brown. Wood red, hard, close grained. Pores small, fairly nu-" "merous, in short radial lines. Medullary Rays fine, numerous and" "regular", and he gives

W=53 lbs.

"The wood is used for agricultural implements. The bark is" "astringent and used to poison fish." (Gamble).

14. PHYLLANTHUS, Linn.

Trees with alternate, entire, distichous, usually deciduous leaves. Flowers small, monœcious, apetalous, axillary sepals 4-6, imbricate. Male flowers in fascicles, stamens 3-5, more or less connate, disk of distinct glands or absent. pistillode absent: female flowers:—yovar 3-celled with 2 ovules in each cell, disk present, styles 3, free or connate, usually bifid, Fruit usually 3-celled, dry or fleshy, splitting into 3 cocci.

490 **P. Emblica**, Linn; Fl. Br. Ind. v. 289; Bedd. Fl. Syl. t. 258; Trimen Fl. Cey. iv 19; Gamble Man. Tim. 599; Brandis Ind. Tr. 570. Tam. and Mal. *Nelli*.

Leaves $\frac{1}{2}$ in. by $\frac{1}{6}$ in, linear-oblong, rounded at base, sub-acute, closely placed and overlapping, nearly sessile, glabrous, paler neneath. Flowers greenish-yellow. $\frac{1}{8}$ in. across, sepals 6, stamens 3, connate throoughout, styles of female flower spreading. Fruit $\frac{1}{2}$ in. diam. globose, fleshy, yellowish-green, seeds triquetrous.

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* Variously spelt Flueggia, Fluoggea and Fluggea.

A small or medium-sized deciduous tree exceedingly common in deciduous forests in the low country and up to 2000 ft. Attains 50 ft. and a diameter of $1\frac{1}{4}$ ft. but is usually 20 to 30 ft. high. In some parts of the country bushes of this tree form a scrub to the exclusion of every other shrub. Found through India, Ceylon and Malaya.

Flowers Feb.—March. Fruit hangs on the tree till Nov.—Dec.

Bark brownish-grey, rough, $\frac{1}{4}$ in. thick, inner substance red. Wood dark. red, rough, hard, close-grained but it cracks and warps, often flawed. Pores small and medium-sized, evenly distributed, sometimes divided. Rays moderately broad, rather distant, prominent on a vertical section. Annual rings indistinct.

$W.=42$ lbs. $P=514$.

Very little use is made of this tree in Travancore except for firewood, its acid fruit is collected and pickled. It reproduces itself freely and holds its own against cattle and goats longer than any other tree. Gamble says that it " makes good poles and is useful " " for agricultural implements, building and furniture ; it is durable" " under water and can be used for well-work." According to the Dict. Econ. Prod. the fruit yields a blackish-grey dye, but it is chiefly used in conjunction with other dyes. The leaves contain a large quantity of tannic acid, much more than the fruit. In medicine the fruit is largely used ; when fresh it is purgative, when dry astringent, and it is therefore largely used in diarrahœa and dysentery. It is made into a sweetmeat, or into a " sherbet " with honey and sugar. The dried fruit is also used as a detergent in place of soap, and for making ink.

15. GLOCHIDION, Forst.

Small trees with alternate, entire, distichous, stipulate leaves, Flowers monœcious (rarely diœcious) apetalous, in axillary clusters. Male flowers: sepals 6 (rarely 5) imbricate, stamens 3-8, connate. Female flowers: sepals 5-6, rarely connate into a calyx. ovary 3-15-celled, styles connate into a globose, conical, erect body, ovules 2 in each cell. Fruit depressed—globose, crowned by the enlarged style 3-or 6-lobed with 2 seeds in each coccus.

Anthers 4 or more, usually 5-7. Female-sepals 5-6, distinct or only connate at the base.

Branchlets and leaves glabrous.

Female flowers sessile. Ovary covered with silky hairs 1. *G. lanceolarium.*

Female flowers pedicelled. Ovary glabrous... ...2. *G. zeylanicum*

Branchlets and leaves tomentose ... ...3. *G. tomentosum.*

Anthers 3. Female sepals 5-6, distinct or only connate at the base.

Female flowers pedicelled ... .4. *G. rigidum.*

Female flowers sessile.

Stipules subulate, style much exserted .. ..5. *G. malabaricum.*

Stipules broad, style scarcely exserted.. .6. *G. ellipticum.*

Anthers 3. Calyx 4-6-toothed.

Branchlets glabrous .. .. ..7. *G. Hohenhackeri.*

Branchlets hairy .. .. ..8. *G. arboreum.*

1. **G. lanceolarium**, Dalz., Fl. Br. Ind. v. 308; Bedd. Fl. Syl. cxcii; Gamble Man. Tim. 601; Brandis Ind. Tr. 573.

Leaves 2-5 in. by 1-2 in. ovate-oblong with a blunt acumination, base acute, glabrous, coriaceous. Petiole $\frac{1}{4}$-$\frac{1}{3}$ in. Flowers yellow, male numerous on $\frac{1}{2}$ in. pedicels, female sessile. Ovary silky, 5-8-celled. Capsule depressed-globose $\frac{3}{4}$ in. diam.

A small tree of the evergreen forests at high elevations, found at Muthukuli Vayal, 4500 ft. Height 30 ft. Diam. 10 in. Also occurs in Bengal and on the Western Ghauts.

Flowers and fruits Feb.—April.

Gamble says that the "bark is brown or grey, soft cleft longi-" "tudinally. Wood reddish-brown, moderately hard. Pores small" "and moderate-sized, scanty, in radial lines between the fine medul-" "lary rays" and he gives.

W = 56 lbs.

2. **G. zeylanicum**, A. Juss; Fl. Br. Ind. v. 310; Bedd. Fl. Syl. cxcii; Trimen F. Cey. iv 28, Gamble Man. Tim 601, Brandis Ind. Tr. 573. Tam. *Kumbala* Mal. *Nirvetti.*

492 Leaves 2-6 in. by 1$\frac{1}{2}$-2 in. oval-oblong, sometimes unequal-sided, obtuse, rounded at base, glabrous and shining on both sides. Petiole $\frac{1}{6}$ in. Flowers yellow in axillary clusters 6-10 together, male and female on short pedicels. Ovary glabrous, style connate into a pointed cone. Fruit $\frac{1}{2}$ in. diam glabrous, orange.

A small tree very common by the sides of streams and in moist places in the low country. Height 30 ft, Diam. 6 in, Found also on the Western Ghauts, Ceylon and Assam.

Flowers and fruits Feb.-May.

Bark $\frac{1}{8}$ in thick, brown, rough and soft, cracked longitudinally. Wood pale, yellowish brown, rather hard. Pores medium sized and small, numerous, in radial lines between the moderately broad rays.

W = 38 lbs.

493 3. **G. tomentosum**, Dalz, Fl Br Ind. v. 309, Bedd. Fl. Syl. cxcii, Brandis Ind. Tr 573.

Leaves 2-4 in by 1-2 in oblong, obtuse base, acute or rounded, softly tomentose above, pale grey beneath. Petiole $\frac{1}{8}$ in. Flowers greenish-yellow, male on $\frac{1}{3}$ in pedicels, female pedicels short Ovary tomentose, 4-5celled. Capsule $\frac{1}{2}$ in. diam.

A small tree 20 25 ft. high and 6 in. diam. common in grass land on Peermade at 4000 ft. Occurs also in Kanara, Malabar and Mysore.

Flowers and fruits Feb.—May.

The wood has not been examined.

494 4. **G rigidum**, Muell. Arg., Fl. Br. Ind. v. 320, Bedd. Fl. Syl. cxciv (under *G. Jussieuanum*), Trimen Fl. Cey. iv. 30, Brandis Ind. Tr. 574.

Leaves 2-4 in. by $\frac{3}{4}$-$\frac{1}{2}$ in. lanceolate acute at both ends, glabrous, stiff. Petiole very short. Flowers greenish-yellow, male and female

on slender pedicels, male somewhat longer. Anthers 3. Ovary 3-lobed, style very stout and long. Capsule depressed, glabrous, $\frac{1}{3}$ in. diam.

A small tree of the evergreen forests at 3000 ft. Height 20 ft. Diam. 6 in. Also found in Ceylon.

Flowers and fruits Mar—May.

Wood not examined.

5. **G. malabaricum**, Bedd, Fl. Br. Ind. v. 319, Bedd. Fl. Syl. cxciv. Gamble Man. Tim. 601, Brandis Ind. Tr. 574. 495

Leaves $2\frac{1}{2}$-4 in. by 1-2 in. oblong-ovate or lanceolate acuminate tapering to base, coriaceous, thin, nearly glabrous. Petiole $\frac{1}{8}$ in. Stipules subulate. Flowers greenish-yellow, male on slender pedicels, female sessile. Ovary hairy, style much exserted. Capsule $\frac{1}{2}$ in. diam. not sunk at the top.

A small tree of the evergreen forests at low elevations. Height 25 ft. Diam 6 in. Also found on the Western Ghauts and the Neilgherries.

Flowers and fruits Jan—May.

Uses unknown.

6. **G. ellipticum**, Wight; Fl. Br. Ind. v. 321; Bedd. Fl. Syl. cxciii (under *G. diversifolium*); Brandis Ind. Tr. 574. 496

Leaves 3-5 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in. oblong-lanceolate, acute, base acute, coriaceous, glabrous. Petiole $\frac{1}{8}$ in. Stipules triangular, often falcate. Flowers greenish-yellow, male pedicelled, female sessile. Ovary tomentose, style not exserted.

A small tree of the evergreen forests at low elevations very similar to the last. Height 20 ft. Diam. 5 in. Also occurs on the Western Ghauts.

Flowers and fruits Jan—May.

7. **G. Hohenhackeri**, Bedd; Fl. Br. Ind. v. 314; Bedd. Fl. Syl. cxciii; Brandis Ind. Tr. 575. 497

Leaves 2-4 in. by $\frac{3}{4}$-$1\frac{1}{2}$ in. ovate-lanceolate, obtusely acuminate, base acute, very glabrous. Petiole very short. Flowers greenish-yellow, male on long pedicels, female sessile in capitate clusters. Calyx in female unequally 4-6 toothed. Anthers 3. Capsule much depressed, 6-8-lobed. $\frac{1}{2}$ in. diam.

A small tree very common in evergreen forests at elevations from 0-3000 ft. Height 25 ft. Diam 1 ft. Also found on the Western Ghuts.

Flowers and fruits Jan—May.

The timber is not used.

8. **G. arboreum**, Wight; Fl. Br. Ind. v. 316; Bedd. Fl. Syl. cxiii; Gamble Man. Tim. 601, Brandis Ind. Tr. 575. 498

Leaves 2-4 in. by 1-2 in. oblong-ovate, acuminate, prominently reticulate beneath, branchlets hairy. Petiole $\frac{1}{4}$ in. Flowers greenish-yellow, male on $\frac{1}{4}$ in. pedicels. female subsessile, both mixed

together. Anthers 3. Calyx in female flowers tubular, unequally 6-toothed, ovary glabrous. Capsule $\frac{2}{3}$ in. diam. Seeds large, red.

A small tree found by Beddome in the evergreen forests of the Peermade Hills at 5000 ft. not seen by me. Also found in the forests of Tinnevelly and on the Neilgherries.

Uses unknown.

16. CROTON. Linn.

Trees with alternate, rarely opposite or whorled leaves usually biglandular, young parts stellate-hairy or scaly. stipules linear. Flowers monœcious in terminal spikes, racemes or panicles. petals present. Male flowers:—sepals 5, imbricate, petals 5, alternating with the sepals: disk-glands opposite the sepals: stamens 10-30 Female flowers:—sepals often enlarged in fruit, petals often wanting, ovary densely stellate-hairy, 3-celled with 1 ovule in each cell, styles very large and spreading. Fruit capsular more or less 3-valved, cocci hard.

Inflorescence lepidote.
- Leaves crenate ... . 1. *C. scabiosus.*
- Leaves entire .. .. 2. *C. malabaricus.*

Inflorescence stellately tomentose or glabrous.
- Inflorescence tomentose .. .. ..3. *C. aromatica.*
- Inflorescence glabrous .. .. ..4. *C. Klotzschianus.*

499 1. **C. scabiosus**, Bedd, Fl. Br. Ind. v. 386, Bedd Fl Syl. t, 283, Gamble Man. Tim. 614, Brandis Ind. Tr. 577.

Leaves 2-4$\frac{1}{2}$ in. by 1$\frac{1}{4}$-3 in. ovate-cordate, obtuse or acute, crenate, 3-5-nerved at base, covered on both surfaces with lepidote scales. Petiole 1-2 in. Flowers in erect racemes 1-4in long. Stamens 10-12. glabrous. Capsule sub-globose, $\frac{1}{2}$ in diam.

A small tree found by Beddome in the evergreen forests of Travancore at 2000-4000 ft. not seen by me. Occurs on the Nallamaleis and other hills of S. India.

Gamble says that the bark is $\frac{1}{4}$ in thick, dark brown and very rough. Wood hard, yellowish-white, close-grained. Pores small in radial strings. Medullary rays very fine and very numerous.

500 2. **C. malabaricus**, Bedd., Fl. Br. Ind. v, 386, Bedd. Fl. Sylcciv: Gamble Man. Tim. 613, Brandis Ind Tr. 577. Tam. *Thavat. tapolavu :* Mal. *Kola vicchi : thènidal : pambaram.*

Leaves 3-6 in. by 1$\frac{1}{2}$-3 in. ovate, acuminate, 3-nerved at base, entire, glabrous or with a few scales above, beneath silvery-lepidote. Petiole 1-3 in. Stipules seaceous, $\frac{1}{2}$-$\frac{3}{4}$ in. Flowers white, $\frac{1}{4}$ in. across in erect racemes 2-5 in. long, upper half male, lower half female. Stamens 10-15. Capsule obovoid, 1 in. long, covered with brown tomentum,

A handsome tree generally about 30 ft. high, but sometimes attaining 60 ft. and a diameter of 1$\frac{1}{4}$ ft. very common in the more

open forests from sea-level to 4000 ft. Occurs through Malabar and the Western Ghauts.

Flowers in April—May. Fruits in Oct.—Dec.

The wood is unknown.

3. C. **aromaticus.** Linn.; Fl. Br. Ind. v. 388; Bedd. Fl. Syl. cciv; Trimen Fl. Cey. iv. 47; Gamble Man. Tim. 614; Brandis Ind. Tr. 577. 501

Leaves $2\frac{1}{2}$-4 in. by 1-3 in. ovate, rounded and 3-nerved at base, acute, shallowly crenate, rough with few stellate hairs above, many below. Petiole 1-$1\frac{1}{2}$ in. Flowers greenish-white, numerous, in erect racemes 4-6 in. long. Petals of male flowers woolly. Stamens 20-30. Styles split into filiform branches. Capsule $\frac{1}{2}$ in. globose, roughs with short hair.

A small tree not uncommon in open forest at 1000-3000 ft. Height 20 ft. Diam. 6 in. Occurs on the Western Ghauts and Neilgherries and in Ceylon.

Flowers in March—April. Fruits in June—July.

The leaves when withering turn a bright red: they are very slightly aromatic. Trimen mentions that the lac of a small red coccid found on the bark of the older trees is collected in Ceylon for the Kandyan lacquer-industry. It goes by the name of "Keppitiya resin."

4 C. **Klotzschianus**, Wight; Fl. Br. Ind. v. 392; Bedd. Fl. Syl. cciv; Trimen Fl. Cey. iv. 49; Gamble Man. Tim. 614; Brandis Ind. Tr. 578. 562

Leaves 1-4 in. by $\frac{1}{2}$-2 in. oblong-lanceolate, rounded at base, acute, shallowly serrate, pale and with scattered hairs beneath. Petiole $\frac{1}{2}$-$\frac{3}{4}$ in. slender, with 2 small glands at the summit. Flowers white in erect racemes 1-3 in. long: male flowers long-pedicelled, stamens about 14: female flowers on short pedicels, styles deeply divided, filiform. Capsule $\frac{1}{3}$ in. 3-lobed, seeds grey, mottled with black.

A small tree found in evergreen forests at low elevations. Height 25 ft. Diam. 6 in. Occurs also on the Western Ghauts and in Ceylon.

Flowers in April—May. Fruits June-Aug.

The wood is unknown.

17. GIVOTIA, Griff.

Small trees with palmately nerved, alternate, toothed, stellately tomentose leaves. Flowers diœcious in axillary and terminal paniculate cymes. Male panicles long, female very short; sepals 5 unequal imbricate; petals 5 connate into a corolla. Male flowerss—stamens about 15, filaments connate below, pistillode none. Female flowers —ovary 2—3 celled with one ovule in each cell, styles short, bifid. Fruit a sub-globose 1 celled drupe with a solitary seed.

503 **G. rottleriformis**, Grifl. Fl. Br. Ind. v. 395; Bedd. Fl. Syl t. 285; Trimen Fl. Cey iv. 50; Gamble Man. Tim. 615; Brandis Ind. Tr. 578. Tam, *Vandarlei*,

Leaves 3-10 in. long and broad, oval, often broader than long; cordate, acute, coarsely dentate, hoary above, with dense, adpressed wool beneath, basal nerves 5-7 pairs. Petiole 4—6in. woolly. Flowers $\frac{1}{6}$ or $\frac{1}{4}$ in. across. Drupe hoary, 1 in. diam. Seed globose, bony.

A small tree confined to the drier parts of the country at low elevations, common. Height 30 ft. Diam. 1 ft. Occurs also in the drier parts of the Deccan, Mysore, the Carnatic and Ceylon.

owers from April-July. Fruits Dec-Feb.

Gamble says that the bark is brown, smooth, $\frac{1}{4}$ in. thick. Wood white, exceedingly light, very soft but even grained. Pores moderate-sized to large, very scanty, often subdivided. Annual rings marked by a dark line. Medullary rays numerous, uniform, fine, with occasional faint, light bars joining them and he gives.

W=17 lbs.

" Growth fast, 2 or 6 rings per inch but the annual rings are "
" perhaps doubtful. The wood is used for carved figures, for toys "
" imitation fruit and other fancy articles, which are lacquered and "
" painted: in Mysore for theatrical masks; also for catamarans."
" The seeds give an oil which is valuable for lubricating fine machi-"
" nery " (Gamble).

18. TRIGONOSTEMON, Blume.

Small trees with alternate, penniveined leaves. Flowers monœcious in racemes or panicles, generally axillary, Sepals 5, imbricate; petals 5, free: stamens 3, connate in a short column; pistillode absent; disk of 5 glands. Ovary 3-celled with one ovule in each cell, styles bifid or twice bifid. Fruit a capsule of 3 cocci.

504 **T. nemoralis**, Thw; Fl. Br. Ind. v. 398; Bedd. Fl. Syl. ccxiii; Trimen Fl. Cey. iv. 58; Gamble Man. Tim. 615; Brandis Ind. Tr. 580.

Leaves 3-8 in. by 1-2 in. linear-lanceolate, tapering to both ends, obtuse, shallowly crenate, glabrous and shining, veins conspicuous. Petiole short, stout. Stipules small, subulate. Flowers dull crimson, males $\frac{1}{4}$ in. across, female $\frac{1}{2}$ in. in erect stiff racemes 2-6 in. ng. Capsule $\frac{1}{2}$ in, diam. 3-lobed, roughly pubescent.

A small tree found by Beddome at 2000-3200 ft. in the evergreen forests, not seen by me. Also occurs in Tinnevelly and in Ceylon.

The properties are unknown.

19. OSTODES, Blume.

Trees with alternate, toothed or entire, penniveined leaves Flowers diœcious in terminal and lateral panicled racemes. Male flowers:—sepals 5, unequal, imbricate; petals 5, free; disk of 5

glands, stamens 15, filaments free, pistillode absent. Female flowers :—disk annular, hairy ; ovary 3-celled with one ovule in each cell : styles 3, bifid. Fruit a sub-globose capsule splitting into 3 bony cocci

O. zeylanica, Muell, Arg ; Fl. Br. Ind. v. 400 ; Bedd, Fl. Syl. t. 274 ; Trimen Fl. Cey. iv. 52 ; Gamble Man. Tim. 616 ; Brandis Ind. Tr. 580. 505

Leaves 6-12 in by 2-5 in. lanceolate-oblong, acute at base. sub-acute at apex, coarsely serrate, glabrous, thick. paler beneath. Petiole 2-5 in. Flowers white, turning pale yellow, fragrant, stalked, in small clusters on panicles 1-2 ft. long. Capsule $1\frac{1}{4}$ in. diam. slightly 6-grooved finely tomentose, seeds mottled-

A large tree common in the evergreen forest about Ponmudi at 1500-3000 ft. Height 60 ft Diam $1\frac{1}{2}$ ft. Occurs also on the Anamalays, Wynaad and Ceyolon.

Flowers April-May. Fruit June-July.

Bark purplish-brown, smooth, $\frac{1}{6}$ in. thick. Wood very white when fresh cut, long-grained and wooly, soft, much resembling deal. Pores moderately-sized to very small, scanty, often divided and in radial strings. Rays fine and close-packed, uniform, crossed by wavy transverse bars. Annual rings indistict.

W=32 lbs. P=421.

The wood is not used. It is perishable and white ants eat it.

20. BLACHIA, Baill.

Small trees with alternate or opposite, entire, shining leaves. Flowers monœcious on long terminal peduncles, male in racemose umbels, female usually in threes ; male flowers ,—sepals 4 or 5, imbricate, petals 4 or 5, much smaller disk of 4 or 5 scales, stamens about 15, pistillode absent ; female flowers .—sepals 4 or 5, unequal, petals none, ovary 3-celled with one ovule in each cell, styles 3, filiform, deeply bifid. Fruit a capsule splitting into 3 cocci.

B. umbellata, Baill ; Fl. Br. Ind. v. 402 ; Bedd. Fl. Syl. ccxiii (under *Codiœum umbellátum*) ; Trimen Fl. Cey. iv. 53 ; Gamble Man Tim. 616 ; Brandis Ind. Tr. 581. 506

Leaves 2-6 in. by $1\text{-}2\frac{1}{2}$ in. ovate lanceolate, acute at base, slightly acuminate, glabrous and shining. Petiole $\frac{1}{4}\text{-}\frac{1}{2}$ in. Flowers pale green $\frac{1}{4}\text{-}\frac{1}{3}$ in. across ; male 8 or 10 together on a peduncle $\frac{1}{3}$ in. long; female 1-4 together on an erect, slender peduncle 1-2 in long. Capsule $\frac{1}{2}$ in glabrous deeply, 3-lobed, seeds oblong, mottled.

A small tree found in our evergreen forests from 1000 to 3000 ft. Height 25 ft. Diam. 6 in. Occurs also on the Western Ghauts and in ceylon.

The wood is unknown.

21. DIMORPHOCALYX, Thw.

Small trees with alternate, entire, penniveined leaves. Flowers large, diœcious, male in axillary and terminal racemes, female solitary or few. Male flowers ,—calyx cupshaped, 5 lobed, petals 5 large.

disk-glands 5, alternate with petals. stamens 10-20, filaments stout, pistillode none. Female flowers,—sepals 5, imbricate, much enlarged in fruit. petals 5, ovary 3-celled with 1 ovule in each cell, style bifid. Fruit a capsule of 3 cocci.

Leaves under 4½ in. Stamens 10. capsule under ½ in diam. . 1. *D glabellus.*
Leaves over 4 in. Stamens 15, capsule over ½ in. diam. 2. *D. Lawianus.*

507 1. **D. glabellus**, Thw; Fl. Br. Ind. v. 403, Bedd. Fl. Syl. t. 273 (under *Trigonostemon Lawianus*). Trimen Fl. Cey. iv 541. Gamble Man. Tim. 616, Brandis Ind. Tr. 581 Tam. *Vellei puna: kalpottan.*

Leaves 3-4½ in. by 1-1½ in. oblong-lanceolate, tapering to base, acuminate subacute glabrous. paler beneath. Petiole $\frac{1}{6}$-$\frac{1}{3}$ in. stipules small. Flowers white, ¾ in across, stalked, calyx of males much shorter than petals, of females much longer, each with a lgand on the back. Stamens 10. Fruit under ½ in. diam. pubescent, seeds ⅓ in. long.

A small tree common in the evergreen forests near Ariankavu and Puliyera at 1000 ft. elevation. Height 25 ft. Diam. 8 in.

Flowers April-May. Fruits Oct.-Nov.

Bark mottled, smooth, 1/20 in. thick, brown and white. Wood white very hard, close-grained. Pores small, few. Rays very fine and numerous, crossed by fine pale bars.

W=72 lbs. P=850.

The wood is not used.

508 2. **D. Lawianus**, Hook. Fl. Br. Ind. v. 404, Bedd. Fl. Syl. t. 273 (under *Trigonostemon Lawianus*), Gamble Man. Tim. 616, Brandis Ind. Tr. 581.

Leaves 4-8 in. by 1½-3 in. oblong-lanceolate, base acute or rounded, acuminate, glabrous. Petiole ¾-1 in. Flowers white, ½ in. across. Stamens 15. Ovary strigose. Fruiting-perianth 1-2 in. diam. seeds ½ in.

A small tree found in Travancore by Beddome at between 3-4000 ft. not seen by me. Occurs also on the Anamalay Hills and the Concan.

It much resembles the last named tree but all parts are larger and it would appear to replace *T. glabellus* at the higher elevations.

22. AGROSTISTACHYS, Dalz.

Small trees with thick, erect, strongly penniveined leaves, serrate or entire. Flowers diœcious in small spikes or long racemes. Male flowers.—sepals 2-5, irregular, valvate, petals 5-8, disk of 5 glands, stamens 8-13 on a convex receptacle, filaments free. Female flowers, sepals 2-5, petals usually 5, disk large, ovary 3-celled with 1 ovule in each cell, styles 3 bifid. Fruit a tricoccous capsule.

509 A. **longifolia**, Benth., Fl. Br. Ind. v. 407., Bedd. Fl. Syl. ccv. (under *Sorcoclinium longifolium*), Trimen Fl. Cey. iv. 56, Gamble Man. Tim. 616, Brandis Ind. Tr. 407. Tam *Mancharei*, Mal. *Mulim pala.*

Leaves 4-10 in. by 2-3 in. or even larger. obovate-oblong, narrowed to base, shortly acuminate. obtuse, entire, glabrous, very stiff, erect at ends of branches. Petiole very short. Stipules short, acute, caducous. Flowers yellow, male 3 or 4 together in erect racemes 4-6 in. long, sepals 2 or 3, petals 5, stamens about 10, female solitary in racemes 2-4 in. long, sepals and petals 5. Capsule $\frac{1}{8}$ in. diam. brown, glabrous, seeds globose.

A small tree of the evergreen forests very common between 2000-3000 ft. Height 30 ft. Diam 8 in. Found also on the Neilgherries Western Ghauts and Ceylon.

Flowers Sep.-Jan. Fruits Nov.-Feb.

Bark dark, thin. Wood pale brown, moderately hard. Pores small arranged in radial lines. Rays very fine, very numerous, indistinct.

P=38 lbs.

The wood is not used except as posts for rough huts. It is inclined to split and does not last.

23. GELONIUM, Roxb.

Small trees with alternate, entire or serrate, glabrous leaves, stipules connate, sheathing caducous. Flowers small, dioecious, apetalous, in axillary clusters. Male flowers, sepals 5-6, distinct, imbricate, stamens numerous, free, pistillode none. Female flowers, sepals 5-6, imbricate, ovary 3 celled with one ovule in each cell, styles 3, bifid or reniform, Fruit tricoccous, seeds globose, arillate.

G lanceolatum, Willd., Fl. Br. Ind. v. 459, Bedd. Fl. Syl. ccxiv, Trimen Fl. Cey. iv. 73, Gamble Man. Tim. 623, Brandis Ind. Tr. 582. 516

Leaves $2\frac{1}{2}$-5 in. by 1-2 in. oblong-lanceolate, obtuse or acute, acute at base, entire or occasionally serrate, thick, glabrous and shining. Petiole very short. Flowers pale yellow, $\frac{1}{4}$ in. across, in clusters or short racemes, stamens 20-40. Capsule $\frac{1}{3}$ in diam., glabrous, rough, seeds globose with large shallow pits.

A pretty little tree not uncommon in secondary forest at low elevations and sometimes planted for ornament. Height 30 ft. Diam. 10 in. Occurs through S. India and Ceylon.

Flowers Sep.-Feb.

"Wood yellow, smooth, close-and even-grained, with a peculiar" "waxy odour, weight 50 lbs. per c. ft. It is well adapted for" "house-building purposes" (Dict. Econ. Prod.)

24. SAPIUM. P. Br.

Trees with acrid milky juice, and alternate, penniveined leaves often 2-glandular. Flowers monoecious, apetalous in terminal or leaf-opposed spikes. Male flowers, calyx a minute 2-3-toothed cup, stamens 2 or 3, free, pistillode none. Female flowers, calyx 3 fid. ovary 3-celled with one ovule in each cell, styles 2-3, undivided Capsule dry, 3-valved.

Evergeen, male and female flowers on the same spike . 1. *S. indicum.*

Deciduous, male and female flowers on separate spike. 2. *S. insigne.*

511 1. **S. indicum.** Willd , Fl. Br. Ind. v. 471 , Bedd. Fl. Syl. ccxv. (under *Excœcaria indica*). Trimen, Fl. Cey. iv. 75 , Gamble Man. Tim. 625 , Brandis Ind. Tr. 584.

Leaves 2-5 in. by ½-1 in. lanceolate, subacute at base, acute, finely serrate, glabrous and shining above. Petiole ⅓ in. Flowers greenish-yellow, sessile in spikes 2-3 in. long, male numerous, females few at the base of same spike. Capsule blackish-green, glabrous depressed-globose, 1 in. diam , cocci woody, seeds ⅓ in long. grey.

A small tree common on the backwaters in the low country. Height 20 ft. Diam. 6 in. Found also in Malabar, Bengal, Ceylon and Tennaserim.

Flowers in April-May.

Gamble says that the bark is smooth, grey. Wood soft, white with small brown heartwood, Pores moderate-sized and large. Medullary rays very fine and closely packed, and he gives.

W.=29 lbs.

"The wood is used in the Sundrabans for fuel. The juice of the tree is very poisonous and the seeds are used to poison fish." (Gamble.)

512 2. **S. insigne,** Benth ; Fl. Br. Ind. v. 471 ; Bedd. Fl. Syl. ccxiv. (under *Excœcaria insignis*); Trimen Fl. Cey. iv. 76 ; Gamble Man. Tim. 625 ; Brandis Ind. Tr. 585.

Leaves 4-9 in by 1½-4 in. oblong-lanceolate, acute at base acute, crenate-serrate, glabrous, dark green above, paler beneath. Petiole 1-1½ in. Flowers green, small, male and female in separate spikes about 6 in. long. Capsule ⅓ in. diam. 2-3 lobed, smooth.

A deciduous tree of medium-size, seen by me growing on rocks, in the evergreen forests of the Peermade plateau. Height 40 ft. Diam 1 ft. Found also throughout S. India and in Bengal, Bombay and Ceylon.

Flowers in Jan.-Feb. when the tree is leafless.

Gamble says the bark is grey, smooth and shining when young, but corky and rough when old. Wood greyish-white soft, spongy. Annual rings faintly marked. Pores moderate-sized and large, often in radial lines, very scanty. Medullary rays very fine, indistinct, and he gives.

W=27 lbs. (average).

"The growth is rather fast, 4 to 7 rings per inch of radius. The" "wood is said to be one of those used for the cylinders of native" "drums. The milk is acrid and said to be poisonous." (Gamble).

25. EXCÆCARIA, Linn.

Small glabrous trees with acrid, milky juice, and alternate or opposite leaves. Flowers minute, monœcious or diœcious and apetalous. Male flowers—sepals 3, minute stamens 3. Female flowers : calyx 3—fid ovary 3-celled with one ovule in each cell, Capsule dry, seeds globose,

E Agallocha, Linn; Fl. Br. Ind. v. 472; Bedd. Fl. Syl. ccxv; Trimen Fl. Cey. iv. 77; Gamble Man. Tim. 626, Brandis Ind. Tr. 585. Mal. *Komatti*. 513

Leaves 2-5 in. by 1-1½ in. lanceolate, acute at base, obtuse, obscurely crenate, glabrous and shining. Petiole ½-1 in. slender. Flower yellow, minute, male sessile on spikes 2-2½ in. long, femele pedicelled, few, in short racemes, stigmas long. Fruit 1 in. diam, round, green, gablrous and shining, seeds sub-globose.

A small much-branched tree. common on the backwaters in the low-country. Height 20 ft. Diameter 4 in. Found through India, Ceylon and China.

Flowers March-April Fruits Oct.-Nov.

Gamble says that the bark is grey. smooth and shining with numerous lenticels. Wood very soft, spongy. Pores small, scanty, usually in radial lines. Medullary rays very numerous, extremely fine, and he gives.

W=25 lbs. (average).

"Grows occasionally to 5 ft. in girth and 40 ft. in height" "though generally cut for posts when of small girth. It is a useful" "wood for general carpentering purposes such as toys, bedsteads," "tables &c., a white timber; the juice which exudes from the bark" "when green is very poisonous." (Gamble quoting from Home's Sundarbans list.)

26. ADENOCHLÆNA. Baill.

Trees with alternate. entire. glabrous leaves. Flowers apetalous, monœcious, in spiciform racemes, male numerous. clustered along the spike, female few. at its base only. Male flowers—sepals 4-6, valvate ; stamens 4-6, free, exserted, filaments slender, pistillode columnar. Female flowers—sepals 5-8, unequal linear. ovary 3-celled with one ovule in each cell, styles large, deeply 3-cleft, arms laciniate. Capsule 3-lobed. seeds globose.

A. indica, Bedd. Fl. Br. Ind. v. 418, Bedd. Fl. Syl. t. 261, (under *Cephalocroton indicum*); Gamble Man. Tim. 617; Brandis Ind. Tr. 586. 514

Leaves 3-7 in. by ½-2½ in. ovate oblong, obtuse, base rounded, coriaceous, shining, nerves 6-8 pairs prominent beneath. Petiole very variable, ½-4 in. Flowers pale green in terminal racemes 2-6 in. long, male minute, female ⅓ in. Capsule sub-globose, scabrous, ¾ in. diam.

A tree of medium-size common on the Cordamom Hills at 3500 ft. in evergreen forests. Height 40 ft. Diam. 1 foot. Found also on the Western Ghauts.

Flowers in Dec. to Jan. Fruits April to May.

The timber is unknown.

27. CŒLODEPAS, Hassk.

Trees with alternate, oblong, entire or toothed leaves. Flowers apetalous, monœcious or diœcious in axillary spikes or clusters. Male flowers:—calyx-3-4 fid. valvate, stamens 4-6, filaments short, flat, pistillode minute. Female flowers:—calyx cupular, 4-10-lobed, imbricate, often enlarged in fruit, ovary 3-celled with one ovule in each cell, styles flattened, spreading. Capsule tricoccous.

515 **C. calycinum**, Bedd. Fl. Br. Ind. v. 419. Bedd. Fl. Syl. t. 320. Gamble Man. Tim. 617, Brandis Ind. Tr. 586. Tam. *Kāttupira.*

Leaves 3-7 in. by $\frac{3}{4}$-$2\frac{1}{2}$ in. linear-oblong, acuminate base rounded crenate-serrate, all parts covered with scurfy pubescence. Petioles $\frac{1}{4}$ in. Stipules subulate, lacearte longer than petioles. Male flowers sessile in axillary spikes 3-4 in. long. Female flowers solitary, pedicellate, ovary pubescent. Capsule $\frac{1}{2}$ in. diam. surrounded by the much enlarged calyx.

A small tree found by Lawson in S. Travancore, not seen by me, confined to the drier parts of the country. Occurs also in Tinnevelly at the foot of the hills about Paupanasam.

Beddome says that the wood is very hard.

28. MALLOTUS, Lour.

Trees with alternate or opposite, often gland-dotted leaves. Flowers small, apetalous diœcious (rarely monœcious) in spikes, racemes or panicles. Male flowers—sepals 3-5, valvate, stamens numerous, distinct, pistillodes none. Female flowers—calyx deeply 3-5-lobed, valvate, ovary 2-or 3-celled with one ovule in each cell, styles short, undivided. Fruit a capsule 2 or 3-lobed, often softly spinous.

Capsule achinate or tubercled.
  Leaves alternate, white beneath ... 1. *M. albus.*
  Leaves opposite, green beneath ... 2. *M. muricatus.*
Capsule smooth.
  Petiole less than 1 in. long ... 3. *M. rhamnifolius.*
  Petiole more than 1 in. long.
    Capsule covered with red, scurfy powder ... 4. *M. philippinensis.*
    Capsule stellate-tomentose ... 5. *M. repandus.*

516 1. **M. albus**, Muell, Arg; Fl. Br. Ind. v. 429; Bedd. Fl. Syl. ccviii. Trimen Fl. Cey. iv. 64. Gamble Man. Tim. 619. Brandis Ind. Tr. 588. Tam. *Mullu polavu.* Mal. *Vatta kumbil.*

Leaves 4-6 in. each way, alternate oblong-oval, sometimes broader than long, acute. base rounded or amplexicaul, entire or sometimes toothed. glabrous and dark green above, silvery-white

beneath. Petiole 3-4 in. slender, with 2 large glands at the top. Stipules subulate, ¼ in. Flowers yellow in panicled, stellate-pubescent spikes 2-6 in long. Capsule ⅓ in, diam., globose, covered with soft woolly spines, seeds black.

A medium-sized, fast-growing tree very common in evergreen forests and especially in secondary forest from sea level to 4000 ft. Height 40 ft. Diam. 1 ft. Common through S. India, Bengal, Ceylon and Burmah.

Flowers and fruits Aug.-Nov.

Bark grey, thin. Wood white, soft, coarse and perishable. Pores medium sized to large, often divided. Rays very fine, very numerous and close togther. Gamble gives.

W.—31 lbs.

The wood is quite useless for any purpose.

2. **M. muricatus**, Bedd: Fl. Br. Ind. v. 4?6. Bedd. Fl. Syl. ccviii: Gamble Man. Tim. 618; Brandis Ind. Tr. 589. 517

Leaves 3-8 in. by 1½-4 in. opposite, lanceolate, obtusely narrowed at both ends. entire or sinuate toothed, shining above, young parts covered with rusty-pubescence. Petiole ½ in. Stipules oblong, glabrous. Flowers yellow, male in spikes 1-2 in. long, female racemes 4-6 in. long. Capsule 3-coccous, each armed with 2 rows of excrescences.

A small tree said by Beddome to be very common in the moist forests of the Western Ghauts from S. Canara down to S. Tinnevelly. Not observed by me. Found by Wight at Courtallum.

3. **M rhamnifolius**, Muell, Arg. Fl. Br. Indi v. 440: Bedd. Fl. Syl. ccix (under *M. zeylanicus*). Trimen Fl. Cey. iv. 66. Gamble Man. Tim. 618. Brandis Ind. Tr. 589. 518

Leaves 2-6 in by 1-2 in. opposite or alternate, oblong-oval, acute or rounded at base, apex subulate, entire, glabrous with minute-yellow scales on lower surface. Petiole ½-1 in. Flowers yellowish-white, male in clusters on the spikes, female solitary on the spikes which are much longer than the male, ovary hairy. Capsule ⅓ in. diam. cocci globose, smoothly pubescent.

A small tree found by Wight at Courtallum, not seen by me. Occurs also in the Deccan Peninsula and in Ceylon.

Uses unknown.

4. **M. philippinensis**, Muell Arg.; Fl Br. Ind. v. 442; Bedd. Fl. Syl. t. 289; Trimen Fl. Cey. iv. 68; Gamble Man. Tim. 619; Brandis Ind. Tr. 590. Eng. The *Monkey-face tree.* Tam. *Korangu Manjanáthi.* Mal. *Manjana: ponoo: Shenkolli: thavatta: kurá madakku-* 519

Leaves 3-7 in. by 1½-3 in. alternate, ovate, lanceolate, rounded or acute at base, sub-acute, entire, glabrous when mature, strongly 3-nerved. covered with scarlet glands beneath. Petiole 1-3 in. Flowers in terminal, brick-red spikes. Capsule smooth, ⅓ in. diam covered with a bright red resinous powder, seeds black.

A small much-branched evergreen tree, very common in open forest at all elevations from sea-level to 4000 ft. Height 4 ft Diam. 1 ft. Occurs through India, Ceylon and Burmah, and in China and Australia.

Flowers Aug-Sep. Fruit Jan-March.

Bark pale brown ¼ in. thick, inner substance red smooth, cracked in old trees No heartwood Wood dull brownish grey or light red, smooth, close grained, hard. Pores small, evenly distributed scanty, often in short radial lines Rays very fine, very numerous and close together. Annual rings indistinct.

W=44 lbs. P=631.

A very common tree, widely distributed, and found both in grass land and moist forest. The wood is perishable, being much bored by insects. It is only serviceable as fuel. "In coppice wood it is a" "useful species as it reproduces very well. The bark is occasionally" "used in tanning, but the chief product is the "Kamela" powder" "powder which is a dye given by the red glands of the capsule." "This powder is collected either dry by shaking the capsules in a" "bag or wet by stirring them in water and collecting the sediment" "in cakes The dye is used chiefly for dyeing silks a bright orange" "or flame colour. It is available in considerable quantities but" "the cost of collection is considerable, so that it is not able properly" "to compete with mineral dyes of the same colour." (Gamble)" "The powder is only very sparingly soluble in either hot or cold" "water, but is completely dissolved in alkaline liquids, forming a" "dark-red solution The resinous yellow colouring matter may be" "separated from the red solution by neutralizing with an acid, or" "else by mere exposure to the air (Appendix to Ind. For. Vol." "XIX). The powder is a valuable anthelmintic (Dict. Econ. Prod).

520 5. M repandus, Muell. Arg. Fl. Br Ind. v. 442; Bedd. Fl. Syl. ccx; Trimen Fl. Cey iv 67; Gamble Man. Tim. 618; Brandis Ind. Tr. 590.

Leaves 2-4 in each way, rhomboid-ovate, slightly peltate at base, acuminate, coarsely dentate, thinly velvety with scattered, stellate scales above, pale beneath Petiole 1½-2 in. Stipules minute. Flowers greenish-yellow, male globose in bud, on short stalks in lax terminal panicles Female or long pedicels. Capsule ½ in. diam. densely covered with stellate tomentum, seeds black.

I do not know this tree, but it has been found in Travancore according to the Fl Br Ind which also says that the trunk is sometime 60-80 ft. long Beddome and Trimen describe it as a shrub or small tree Gamble and Brandis as a large straggling shrub. It is widely distributed through India, Ceylon and Burmah. Uses unknown.

29. TREWIA, Linn.

Trees with opposite, entire leaves with 3-5 basal nerves. Flowers apetalous, diœcious, in axillary pendulous racemes, male numerous, female very few. Male flowers globose, sepals 3 (or 4), valvate, stamens numerous, pistillode none. Female flowers.—sepals 3-5,

caducous, ovary hairy, 2-4 celled with 1 ovule in each cell, styles connate below, papillose all over, very long. Fruit globose, indehiscent, seeds 3 or 4.

T. nudiflora Linn; Fl. Br. Ind. v. 423; Bedd. Fl. Syl. t. 281, Trimen Fl. Cey. iv. 61; Gamble Man. Tim. 617; Brandis Ind Tr. 590. Tam. *sanna thuvarai*. Mal. *Pambara kumpil, malam kumpil, nai kumpil.* 521

Leaves 2-8 in. by $1\frac{1}{2}$ to 5 in. ovate, cordate at base, acuminate, glabrous above, finely stellate-hairy on the veins beneath, thin. Petiole 1-3 in. long. Flowers pale green, male $\frac{1}{4}$ in across in racemes 3-5 in long: female—ovary $\frac{1}{4}$ in. diam. styles 1 in. Fruit $\frac{3}{4}$ in. diam. rough with scattered hairs. seeds brown.

A medium-sized deciduous tree of the evergreen forests at low elevations up to 1000 ft. common. Height 50 ft. Diam, 1 ft. Distributed though India, Ceylon and Assam.

Flowers Feb-March. Fruits June-July.

"Bark smooth, grey. Wood white, soft, not durable. Pores" "moderate-sized, subdivided and often elongated, the transverse" "diameter several times greater than the distance between the" "closely packed, uniform, fine medullary rays. Fine ladder-like" "straight or oblique bars crossing the tissue between the rays" (Gamble),

W = 29 lbs.

"The wood is a good one for purposes for which a soft wood is" "required, but like most of the soft, white woods it has to be cut" "up when green, and seasoned in dry air if it is to retain its white" "colour, and not get discoloured of a muddy grey. It is used for" "drums and, according to Brandis for agricultural implements." (Gamble), In Travancore the wood is used for the carved images in Roman Catholic Churches.

30. MACARANGA, Thouars.

Trees with alternate, usually peltate leaves, glandular beneath, 3-5-nerved. Flowers apetalous, usually diœcious in axillary racemes or branched panicles, male many, minute, female few. Male flowers—sepals 3-4 valvate, stamens 2-14 free. anthers 3-4 celled; pistillode none. Female flowers—calyx 2-4 lobed. ovary 1-6-celled with one ovule in each cell. Fruit a capsule of 1-5 cocci often glandular, seeds globose.

M. Roxburghii. Wight; Fl. Br. Ind. v. 448; Bedd. Fl. Syl. t. 287 (under *M. tomentosa*, Trimen Fl. Cey. iv. 70 (under *M. tomentosa*); Gamble Man. Tim. 621; Brandis Ind. Tr. 592. Tam. *Vattakanni*: *vattathamarai*. Mal. *Vatta.* 522

Leaves 5-10 in. each way, orbicular with a long acumination, peltate. entire or minutely toothed, glabrous, dark green above, pale beneath veins red prominent beneath. Petiole 5-10 in. Stipules large, ovate, acuminate. Flowers greenish-yellow, male in dense clusters concealed in large bracts. arranged in panicles springing from

the branches, female in smaller panicles, 1 or 2 enveloped in each bract. Capsule globose, $\frac{1}{4}$ in. diam. densely covered with waxy glands.

A weak tree of very rapid growth, extremely common in secondary forest, springing up whenever land has been cleared for cultivation. Height 40 ft. Diam. 1 ft. Found in the Western Ghauts and in Ceylon.

Flowers and fruits Jan—March.

Bark pale, covered with small lenticels. Wood pale brown, coarse, soft, with a mottled appearance. Pores large, often divided, abundant, usually in radial lines. Rays very fine, close together and inconspicuous, giving a silver-grain.

W=27 lbs. P=403.

The wood is bored by beetles and is very perishable. The gum is used as a substitute for gum arabic to fasten up letters, and in medicine. "It is of a light crimson colour and has been used for taking impressions of leaves, coins, medallions &c." (Dict. Econ. Prod.)

A similar tree *M. indica* may very likely be found in Travancore as it is common on the Western Ghauts and in Ceylon, though it has not yet been observed here. It differs from the above by having minute bracts which do not conceal the male flowers and the stamens are more numerous.

31. CLEIDION, Blume.

Trees with alternate glabrous leaves. Flowers diœcious, apetalous, male in axillary racemes, female solitary. Male flowers:—sepals 3 or 4, valvate; stamens very numerous, filaments free anthers 4 celled; pistillode none. Female flowers:—sepals 3-5, imbricate; ovary 2-3. celled with one ovule in each cell; styles 2-3, bifid with long branches. Fruit a capsule of 2-3 cocci.

523 C. **javanicum**, Blume: Fl. Br. Ind. v. 444; Bedd. Fl. Syl. t. 272; Trimen Fl. Cey. iv. 69; Gamble Man Tim. 620; Brandis Ind. Tr. 692; Mal. *Yellari*.

Leaves 3-7 in. by 1-2½ in. ovate-lanceolate, acute at base, shortly acuminate, distantly crenate, glabrous, dark green, paler beneath, Petiole 1-3 in. Flowers pale green, male $\frac{1}{4}$ in. across, in racemes 3-5 in. long, female solitary on long peduncles. Capsule 1 in. diam., globose, slightly didymous. containing one round grey-black seed $\frac{1}{2}$ in. diam.

A medium-sized evergreen tree common below 1000 ft. in the Achenkovil Valley and elsewhere in our moist forests. Height 70 ft. Diam. 2 ft. Also found in Bombay, S. India, Ceylon, Bengal and Burmah.

Flowers Dec—Jan. Fruits May—June.

Bark greenish-white, smooth, $\frac{1}{4}$ in. thick. Wood greyish-white soft, no heart. Pores medium-sized, scanty. Rays moderately broad, very indistinct.

W=40 lbs. P=452.

Beddome states that the wood is said by the natives to be hard and good for building purposes, but this is not correct. It is readily eaten by insects and is very perishable.

ORDER LXVI. ULMACEÆ.

Trees with watery sap and simple, stipulate leaves. Flowers bisexual or unisexual. Perianth alike in all flowers, 4-9-lobed stamens usually opposite to perianth-lobes and equal in number to them. Ovary superior, of 2 carpels usually 1-celled with one pendulous ovule in each cell. Fruit an indehiscent samara or drupe.

A small Order containing only 5 Travancore trees. In the Fl. Br. Ind. and most books on Botany the species here shewn are included under Urticaceæ, but I follow Brandis in dividing that order into Ulmaceæ, Moraceæ and Urticaceæ.

Fruit a winged samara .. .. .. 1. *Holoptelea*
Fruit a drupe
Male-sepals imbricate
Leaves 3-veined at base, stipules free .. 2. *Celtis*.
Leaves penniveined, stipules connate, convolate .. 3. *Gironniera*.
Male-sepals induplicate-valvcate . .. 4. *Trema*.

1 HOLOPTELEA, Planch.

A tree with alternate penniveined leaves : stipules scarious. Flowers polygamous : sepals 5-8, imbricate ; stamens 5-8 or more ; ovary 1-celled, stipitate, compressed ; stigmas 2, subulate. Fruit a dry, winged samara, seed flat.

524 **H. integrifolia**, Planch ; Fl. Br. Ind. v. 481 ; Bedd. Fl. Syl. 310 (under *Ulmus integrifolia*) ; Trimen Fl. Cey. iv. 80 ; Gamble Man. Tim. 628 ; Brandis Ind. Tr. 595 *Ayli. Aval*.

Leaves 3-5 in. by 1-2 in. ovate-oblong, base rounded or cordate, acuminate, entire (serrate when young), glabrous, veins 5-7 pairs, conspicuous beneath. Petiole $\frac{1}{3}$ in. Flowers greenish-purple, $\frac{1}{8}$ in. across, both sexes mixed in branched axillary fascicles about 8 in. long. Samara orbicular, greenish-red, about 1 in. broad, notched at the top, very flat, wings veined.

A very large deciduous tree common in evergreen forests throughout Travancore at low elevations. Height 90 ft. Occurs throughout India, Burmah and Ceylon.

Flowers in Jan-Feb when the tree is bare of leaves. Fruits May-June.

Gamble says that the bark is $\frac{1}{3}$ in. thick, whitish-grey, with an offensive smell when fresh. Wood light yellowish-grey, moderately hard, no heartwood. Pores small, joined by faint lines of soft texture. Rays fine, short, undulating and uniform, growth fast, and he gives.

W = 40 lbs.

Beddome says that the wood is much in use for building and for carts and for a variety of purposes. Brandis (For. Fl. N. W. Ind.) says that it is employed in building, for carts and carving ; durability

uncertain, much used for fuel and charcoal. Gamble says that the wood is strong, but is little used, and an oil is extracted from the seeds, Not used in Travancore.

2. CELTIS, Linn.

Evergreen trees with alternate leaves, 3-veined at base, red when young, stipules free Flowers polygamous, cymose or solitary, axillary; sepals, 4-5, imbricate; stamens 4-5, short, erect in bud: disk hairy: ovary sessile, stigmas 2, slender or flattened. Fruit a drupe, seed ovoid.

Fertile flowers on long axillary peduncles, solitary or in pairs. . 1. *C. tetrandra.*

Fertile flowers in axillary dichotomous panicles . . 2. *C cinnamomea.*

1. **C. tetrandra** Roxb; Fl. Br. Ind. v. 482; Bedd Fl Syl. cexvii (under *C serotina*); Gamble Man. Tim. 630; Brandis Ind. Tr. 596. Tam. *Murangan*; *kuviya* 525

Leaves $1\frac{1}{2}$-3 in. by $\frac{3}{4}$-$1\frac{1}{4}$ in obliquely ovate with a long acumination, narrowed to base, coarsely serrate from the apex to below the middle, young parts strigose, glabrous in age. Petiole $\frac{1}{3}$ in Flowers pale yellow, male in axillary clusters, female solitary or 2 together on slender peduncles. Fruit a glabrous, ovoid drupe about $\frac{1}{2}$ in. long.

A handsome tree common in all the sholas of Peermade, the Cardamom Hills and the High Range above 3500 ft Height 60 ft. Diam 2 ft. Found through India and Burmah, but absent from Ceylon.

Flowers in Jan-March with the young leaves. Fruits May-June.

Bark $\frac{1}{4}$ in. thick, dark-grey, smooth. Wood greyish-white, rather soft. Pores numerous of two sizes, those forming the inner edge of the annual rings large, those of the rest of the wood of medium size and scattered. Rays moderately broad and fine, easily seen on a cross section. Annual rings 5-10 per inch.

W=42 lbs. P=356.

Gamble says that the wood is used in Assam for planking and canoes, and compares it with *C. australis* a very useful wood of North India and Europe. Not used in Travancore.

2. **C. cinnamomea**, Lindl; Fl. Br. Ind. v. 482; Bedd Fl. Syl. ccxix (under *dysdoxylon*); Trimen Fl. Cey. iv. 81; Gamble Man. Tim. 629; Brandis Ind. Tr. 596; Tam. *Pinari*. Mal. *Bhutha: bhutha, bhutha-onatthi.* 526

Leaves 3-6 in. by 1 to 2 in. oblong-ovate, abruptly acuminate rather oblique, narrowed to the base, upper part coarsely serrate glabrous, dark-green, reticulate. Petiole $\frac{1}{4}$-$\frac{1}{3}$ in. Flowers greenish small, male in short racemose cymes, female in more selender cymes Drupe globose-acuminate.

A small tree fairly common at elevations from 500-1500 ft. in ever-green forest Height 30 ft. Diam. I ft. Occurs in Bengal, Ceylon and Burmah.

Flowers Feb.-March. Fruits May-June.

Bark $\frac{1}{4}$ in. thick, pale green, covered with small lenticels. Wood dull white, with a small patch of dark-coloured wood at the centre, extremely hard.

W=59 lbs. P=706.

The wood has a most disgusting odour resembling human ordure when the tree is first cut. This odour passes off but if chips are cut from the wood and put into water it again returns. The wood is highly valued as a medicine in Travancore, especially for head-ache, as well as in Ceylon. " When scraped fine and mixed with lemon juice it is taken internally as a purifier of the blood in itch and other cutaneous eruptions, the body being at the same time anointed externally " (Dict. Econ. Prod.)

In addition to the above *C. Wightii* a tree of medium size may also very likely be found in Travancore as it occurs in Tinnevelly and Ceylon. It differs from the two species described above by its almost entire, equal-sided leaves, and flowers in axillary panicles.

3. GIRONNIERA, Gaud.

Evergreen trees with alternate, penniveined leaves. Stipules connate, sheathing the buds. Flowers diœcious in short axillary cymes or the female solitary. Male flowers globose, sepals 5, broad, imbricate, stamens 5, pistillode woolly. Female flowers :—sepals narrower than in the male : ovary sessile, stigmas 2, filiform spreading. Fruit a drupe.

G. reticulata, Thw.. Fl. Br. Ind. v. 486, Bedd. Fl. Syl. t. 313. Trimen Fl. Cey. iv. 83. Gamble Man. Tim. 631, Brandis Ind. Tr. 596. 527

Leaves 3-7 in. by 1-3 in oblong-ovate with a long acumination, base rounded or acute, glabrous and shining, finely reticulate. Petiole $\frac{1}{4}$-$\frac{1}{2}$ in. Male flowers in short axillary panicles, female solitary in the leaf-axils. Drupe $\frac{1}{2}$-$\frac{3}{4}$ in, ovoid, glabrous, stoutly beaked, slightly 2-angled.

Beddome describes this as a large timber tree found in the Ghat forests up to 3000 ft. from S. Canara down to Tinnevelly and Travancore, but I have not seen it. The tree also occurs in Ceylon, but is rare, and in Sikkim and Burmah.

Flowers Feb.-March (in Ceylon).

Beddome says that the wood is very hard and heavy, and is a valuable engineering timber. Gamble says that it is red-brown and used in Sikkim for planking and rafters.

4. TREMA, Lour.

Evergreen trees with alternate, distichous, serrate leaves. 3-veined at base. Stipules lateral, caducous. Flowers in small axillary clusters, polygamous, monœcious or diœcious. 3-bracteolate. Male sepals 4-5, induplicate-valvate, female sepals smaller. Stamens 4-5, erect in bud, ovary sessile, styles incurved. Drupe ovoid.

528 **T. orientalis,** Blume, Fl. Br. Ind. v. 484, Bedd. Fl. Syl t. 311 (under *Sponia Wightii*), Trimen Fl Cey. iv. 82, Gamble Man. Tim. 640, Brandis Ind. Tr. 597. Eng *The Charcoal tree.* Tam. *Ambaratthi, oman, mudalei, mini.* Mal. *Ami; ratthi.*

Leaves 3-6 by 1-2½ in., oblong lanceolate, acuminate, crenate-serrate, base unequal, rounded on one side, scabrid and dark green above, covered with soft silvery hairs beneath. Petiole ⅓-½ in. Flowers greenish, very numerous in half inch clusters. Drupe black, ⅙ in. diam.

A small tree of very rapid growth springing up wherever there has been any clearing of forest from sea-level to 8000 ft. Height 40 ft. Diam. 1½ ft. Common through Bengal, the Western Ghauts, Ceylon and Malaya.

Flowers in Feb.-March. Fruits April-May.

Bark pale, smooth, ¼ in. thick, with numerous lenticel. Wood light reddish-grey, moderately hard, spongy and coarse, darker in the centre of the tree. Pores scanty, medium sized to large. Rays of medium breadth, white, equidistant, crossed by alternating wavy bands of dark and light tissue.

W = 30 lbs. P = 297.

The wood is used to make gunpowder-charcoal, but it is a bad fuel, and is useless for other purposes being very perishable. The bark yields a fibre used for tying bundles. The tree is sometimes left for shade over coffee, but being shortlived it does not answer as a permanent shade-tree.

ORDER LXVII. MORACEÆ.

Trees with milky sap, leaves usually alternate, stipules large, often amplexicaul. Flowers unisexual, frequently crowded on or within receptacles which are globose, cylindrical or hollow. Perianth of male flowers of 2-6 segments, that of female flowers of 4 segments, often persistent and fleshy in fruit. Ovary 1-celled with 1 pendulous ovule, rarely erect.

This Order contains 26 Travancore trees, most of them belonging to the genus *Ficus** which are as a rule, lofty trees with useless wood. The 3 species of *Artocarpus* yield fine timber. To this Order belong all the species of *Morus* "Mulberry" of temperate climates; *Broussonetia papyrifera*, the "Paper Mulberry" of Japan, *Ficus elastica*, the "India rubber fig" of N. India and *F. Carica* the "Edible fig" from Turkey.

Male and female flowers borne in hollow receptacles. 1. *Ficus.*
Male and female flowers borne on the outside of solid receptacles.
  Large unarmed trees . 2. *Artocarpus.*
  Small armed trees . 3. *Plecospermum.*
Male flowers on the outside of a flat receptacle, female flowers solitary.
  Large trees; female perianth 0 . 4. *Antiaris.*
  Small trees; female perianth of 4 sepals . 5. *Streblus.*

* The above description and the natural classification farther on have been abstracted from Sir George King's Monograph on the species Ficus of the Indo-Malayan and Chinese countries.

1. FICUS, Linn.

Trees often commencing life as epiphytes, sending out roots which embrace the trees on which they are growing and eventually become lofty trees. Leaves usually alternate, entire, lobed or toothed, stipules deciduous. Flowers minute, mixed with thin bracteoles, crowded together on the inner surface of hollow receptacles, the mouth of the receptacle being closed by numerous scales in several rows. Flowers of five kinds (a) male (b) pseudo-hermaphrodite (c) female (d) gall and (e) neuter. The male flowers have 1-3 stamens, the pseudo-hermaphrodite one stamen and a rudimentary pistil which is never fertile; the female have a pistil, ovary and filiform styles; the gall flowers resemble the female but have a short style and are more often pedicellate; the neuter are long pedicellate and have a 3-leaved perianth without any trace of either anther or pistil. The flowers are found together in the receptacles, as shown below, in some cases the male, female and gall flowers together, in others the male or pseudo-hermaphrodite and gall flowers together. and the female in separate receptacles with or without neuters. The gall flowers do not usually develop an embryo but are visited by Hymenopterous insects (*Blastophaga*) which lay their eggs in them. The perfect insect on leaving the receptacle carries away the pollen of the male flowers and with it fertilizes the female flowers in another receptacle. Even when not properly fertilized the receptacles are edible, but they are neither as heavy nor as sweet as those in which the seeds have formed, nor will they keep as well. The receptacles generally require several months to ripen: they as a rule, become fleshy and enclose numerous minute achenes.

"The wood-structure is very uniform. Wood usually soft characterized by alternate bands of soft and hard tissue. Medullary rays of moderate breadth, wavy." (Gamble).

Receptacles axillary or above the scars of fallen leaves, usually solitary or in pairs Basal bracts O.

- Leaves scaberulous, receptacles warted . 1. *F. gibbosa.*
- Leaves glabrous, receptacles puberulous . 11. *F. nervosa.*
- Leaves very scabrid, receptacles scabrous-hispid. 18. *F. asperrima.*

Basal bracts 2-4 usually 3.

Petioles stout, under 2 in (except in *F. Beddomei*), never joined to blade.

Leaves cordate or rounded at base.

Receptacles pedunculate

- Leaves cordate, acuminate, puberulous . 2. *F. Dalhonsiæ.*
- Leaves rounded at base, acuminate, glabrous. 6. *F. Beddomei.*
- Leaves rounded at base, apex rounded, glabrous. 17. *F. callosa.*

Receptacles sessile

- Leaves glabrous, lateral nevers 5-8 pairs, receptacles globose, smooth. 3. *F. bengalensis.*

Leaves tomentose beneath, lateral nerves
10-13 pairs receptacles ovoid, smooth. 4. *F. mysorensis*.
Leaves grey-hoary beneath, lateral nerves
5-8 pairs, receptacles tomentose. 5. *F. tomentosa*.
Leaves narrowed to base
Lateral nerves numerous with few reticulate veins between
Leaves ovate, abruptly acuminate . 7. *F. Benjamina*.
Leaves oblong oval, obtuse or acute . 8. *F. Trimeni*.
Lateral nerves fewer with numerous reticulate veins between
Leaves rounded or acute, petiole under ½. 9. *F. retusa*.
Leaves caudate-acuminate, petiole over ¾. 10. *F. Talboti*,
Petioles long and slender from 1½-6 in., sometimes jointed to blade
Apices of leaves caudate-acuminate
Bases of leaves rounded not cordate, apical
caudæ very long. 12. *F. religiosa*
Bases of leaves cordate, apical caudæ short. 13. *F. Arnottiana*.
Apices of leaves not caudate-acuminate
Receptacles clustered, under ½ in. diam. . 14 *F. Tjakela*.
Receptacles in axillary pairs
Leaves coriaceous lateral nerves indistinct. 15. *F. Tsiela*.
Leaves membranous, lateral nerves distinct. 16. *F. infectoria*.
Receptacles chiefly in dense clusters on tubercles or leafless branches
Leaves opposite. hispid . 19. *F. hispida*.
Leaves alternate, glabrous . 20 *F. glomerata*.

Natural sections to which the tree-*Fici* of Travancore belong.

Sec: I Palæmorphe. Pseudo-hermaphrodite flowers monandrous, in the same receptacles with gall-flowers. Female flowers in separate receptacles. 1. *F. gibbosa*.

Sec: II. Urostigma. Male flowers monandrous (except 17. *F callosa*) in the same receptacles with female and gall flowers. 2. *F. Dalhousiae*; 3. *F. bengalensis*; 4, *F. mysorensis*; 5. *F. tomentosa*; 6. *F. Beddomei*: 7. *F. Trimeni*; 9. *F retusa*; 10. *F. Talboti*; 11. *F nervosa*: 12. *F religiosa*; 13. *F Arnottiana*; 14. *F. Tjakela*; 15. *F. Tsiela*; 16, *F. infectoria*; 17. *F. callosa*.

Sec. III. Synœcia. Male flowers monandrous in the same receptacles with gall flowers; female and neuter flowers in separate receptacles. Not represented in Travancore.

Sec. IV. Sycidium. Male flowers monandrous with gall flowers in one set of receptaceles, female in another set. 18. *F. asperrima*.

Sec. V. Covellia. Male flowers monandrous in the same receptacles with gall flowers, female flowers in separate receptacles. Receptacles growing in leaf axils or on leaflesss branches from the old wood. 19, *F. hispida*.

Sec. VI. Eusyce. Male flowers usually diandrous in the same receptacles with gall flowers, female in separate receptacles. Not represented.

Sec. VII. Neomorphe. Male flowers usually diandrous in the same receptacles with gall flowers, female in separate receptacles or in the same with male and gall flowers. Receptacles in dense clusters from tubercles on the stem and branches. 20. *F. glomerata.*

1. F. **gibbosa**, Blume ; Fl. Br. Ind. v. 496 ; Bedd. Fl. Syl. ccxxiv (under *F. parasitica*) ; Trimen Fl. Cey. iv. 85 (under F. *parasitica*) ; Gamble Man, Tim. 637 ; Brandis Ind. Tr. 599. Tam. and Mal *Itthi*: *kal-itthi*. 529

Leaves 1-6 in. by $\frac{3}{4}$-4 in, alternate, oblong or lanceolate, sides often unequal, acuminate narrowed to base, smooth above, scaberulous and yellow beneath, nerves 3-7 pairs prominent. Petiole $\frac{1}{4}$ in. Stipules lanceolate $\frac{1}{4}$ in. No aerial roots. Receptacles axillary, solitary or in pairs, pyriform, $\frac{1}{3}$ in. diam, warted, without basal bracts on $\frac{1}{3}$ in. peduncles. Male and gall flowers in one set of receptacles, female flowers in another set. Figs yellow when ripe.

An epiphytic shurb growing into a handsome tree of considerable size, up to 60 ft. high and $1\frac{1}{2}$ ft. diam. Common through Travancore from sea-level to 4000 ft. Found through India, Ceylon and Burmah.

Fruits ripens Jan.-March.

Bark thin, smooth, greenish-grey, $\frac{1}{2}$ in. thick. Wood brownish-grey, soft, with alternating rings of harder dark wood and paler soft wood. Pores moderate-sized to large, few. Rays moderately broad, pale, distant and short.

W=42 lbs. P=443.

The wood is useless. The bark, especially of the root is much valued in Travancore as a stomachic and gentle aperient. The "decoction of the roots acts as a powerful purgative. The leaves are" "used to polish ivory" (Dict Econ. Prod.)

2. F. **Dalhousiæ**, Miq ; Fl. Br. Ind. v. 499 ; Gamble Man Tim. 638 ; Brandis Ind. Tr. 601. Tam. *Kal-ál*. 530

Leaves 6-10 in. by 4-7 in. (up to 18 in. long in young shoots), alternate, entire, broadly ovate, acute, base cordate, 3-7 nerved, softly pubescent when young, soft and finely reticulate when mature nerves prominent beneath, 10-15 pair. Petiole 2-5 in. Stipules $\frac{3}{4}$-2 in. Aerial roots none. Receptacles in axillary pairs, obovoid, pubescent, about $\frac{3}{4}$ in. long, on short peduncles $\frac{1}{3}$ in. long, basal bracts 3, broad, spreading. Male, female and gall flowers in the same receptacles. Figs greenish-yellow when ripe.

A handsome tree of medium size generally found growing on rocks: seen near Arienkavu and Tenmalei, rare. Height 30 ft. Diam, 8 in. Also found on the Neilgherries at 2-3000 ft.

Fruit ripens April-July.

The wood has not been examined.

3. F. **bengalensis**, Linn ; Fl. Br. Ind. v. 499 ; Bedd. Fl. Syl. ccxxii ; Trimen Fl. Cey. iv. 86, Gamble Man. Tim. 638, Brandis Ind. Tr. 660. Eng. *The Banyan Tree*. Tam. and Mal. *Al:pér-ál* 531

Leaves 4-8 in. by 2-5 in., alternate, oval or ovate-oblong, obtuse or obtusely cuspidate, base rounded or subcordate, pubescent when young, at length glabrous, basal nerves strong, lateral 5-8 pairs. Petiole ½-2 in. Stipules ¾-1 in. Aerial roots large and numerous. Receptacles in axillary pairs, sessile, globose, about ¾ in. diam, basal bracts 3, spreading. Male, female and gall flowers in the same receptacles. Figs red when ripe.

A very large umbrageous tree indigenous in the subhimalayan tract and grown in avenues all over India. In Travancore it is frequently planted on road-sides and has become naturalised every where, but I cannot remember seeing it in the interior forests. It usually commences life as an epiphyte in the fork of some tree where the seed has been dropped by a bird, and finally grows into a tree 70-100 ft. high with a stem 8-10 ft. in diam. Roots drop from the horizontal branches and establish themselves in the ground, thus constantly adding to the area covered by the tree. Gamble mentions some large trees. The well known tree in the Royal Botanic Gardens Calcutta was 85 ft. in height in 1900, and it had 464 rooted drops: the circumference of the trunk was 51 ft. and that of the crown 938 ft. Other trees are known with a circumference of crown up to 2000 ft. but these are mostly in N. India. There is a large tree in the N. Arcot District and another near Madura, but I have never heard of any such specimens in Travancore.

Receptacles ripen at all times. I have obtained them ripe in January, March, April, October and December. The tree loses its leaves about the end of the year but soon renews them.

Bark greyish-white, smooth, ½ in. thick. Wood greyish-white, moderately hard, consisting of alternate rings of dark and light tissue. Pores medium-sized to very large, few. Rays fine, distinct but few. Gamble takes as on average.

W=36 lbs. P=600.

Gamble mentions that the name "Banyan" was, according to Yule and Burnell, given to a tree growing near the Gombroon (Bandar Abbas in the Persian Gulf) under which some banians or Indian traders had built a pagoda. The tree is sacred and Hindus object to cutting it any where in the forests.

"The wood is esteemed of little value, but is durable under" "water, and therefore used for well-curbs. If carefully cut and" "seasoned it has a pretty grain and good texture, and can be made" "into furniture. It is sometimes used for boxes and door-panels." "The wood of the drops is stronger, and is used for tent-poles, cart-" "yokes &c." (Gamble).

A coarse fibre is made from the bark and aerial roots, the milky juice is converted into bird-lime, and the juice, bark seeds and leaves are used in native medicine. (Dict. Econ. Prod.)

This tree is employed more frequently than any other for avenues, and for this purpose cuttings of 5 or 6 ft. long may be put in before the monsoon when they will readily take root.

4. **F. mysorensis**, Heyne ; Fl. Br. Ind. v. 500 ; Bedd. Fl. Syl. 532
ccxxiii ; Trimen Fl. Cey. iv. 86 ; Gamble Man. Tim 638 ; Brandis Ind. Tr. 601.

Leaves 4 to 8 in. by $1\frac{1}{2}$-3 in., alternate, entire, ovate, shortly acuminate, base rounded or cordate, covered with rusty-grey tomentum when young, at length glabrous above, basal nerves 3-5. lateral 10-13 pairs, prominent beneath. Petiole $\frac{1}{2}$-$1\frac{1}{2}$ in. Stipules broad, $\frac{1}{4}$-$\frac{1}{2}$ in. Aerial roots few. Receptacles in axillary pairs, sessile, oblong, 1 in. long, basal bracts 3, spreading. Male female and gall flowers in the same receptacles. Figs orange-red when ripe.

A very large umbrageous tree common in the forests at low elevations and often planted in avenues. Height 80 ft Diam. 3 ft. Found in N. India, Assam, S. India and Ceylon

Fruits ripen Dec.-April.

The wood is soft and useless. The tree is of no value except for avenues.

5. **F. tomentosa**, Roxb. Fl. Br. Ind. v. 501, Bedd. Fl. Syl. 533
ccxxiii. Trimen Fl. Cey. iv, 87. Gamble Man. Tim. 640. Brandis Ind. Tr. 601.

Leaves 2-5 in. by 1-3 in.. alternate. entire, ovate, bluntly apiculate base rounded or cordate, covered with rusty-grey tomentum when young, at length glabrous above, grey-downy beneath, basal nerves 5-7, lateral about 5 pairs, prominent. Petiole $\frac{3}{4}$-1 in Stipules $\frac{1}{2}$ in. densely woolly outside. Aerial roots few. Receptacles in axillary pairs, sessile, pisiform, tomentose. about $\frac{1}{3}$ in. diam. basal bracts 3. spreading. Male, female and gall flowers in the same receptacles, Figs grey when ripe.

A large tree usually epiphytic confined to the drier parts of the country such as the Anjinaad Valley and South Travancore. Height 50 ft, Diam. 1 ft. Also occurs in N. and S. India and Ceylon.

Fruits ripen July-Sep.

"Bark greenish-white, $\frac{1}{4}$ in. thick, smooth. Wood moderately" "hard, white, with alternate bands of soft pale and firm dark tissue," "very regular and concentric. Pores moderate-sized to large. very" "scanty, often subdivided. Medullary rays fine, prominent, equi-" "distant" Gamble).

W=41 lbs.

The wood is useless.

6. **F. Beddomei**, King. Fl. Br. Ind. v. 502. Gamble Man. 534
Tim. 638 (under *F. Rama Varmae*), Brandis Ind. Tr. 600. Mal. *Thavatta al.*

Leaves 6-10 in. by 4-6 in., alternate, entire, slightly undulate, broadly ovate, shortly acuminate, base broad, rounded or truncate, all parts glabrous, dark green above paler beneath, lateral nerves 12-15 pair, prominent on both surfaces. Petiole stout, 2-4 in. Stipules 3-6, golden-yellow. Aerial roots none. Receptacles in axillary pairs, subglobose but 3-ribbed, smooth, each $\frac{3}{4}$ to 1 in. diam. on one-

in. peduncles, basal bracts 3, small, Male gall and female flowers in the same receptacles. Fruit green, spotted with yellow when ripe.

A fast-growing evergreen tree of immense size beginning life as an epiphyte or rooting directly in the ground, in the evergreen forest attaining a height of 100 ft. and a diam. of 5 ft., but in the open inclined to throw up several stems and to branch early, common at elevations between 1000-4000 ft. Also found in Tinnevelly.

Fruits ripen March-May.

Bark pale-brown, smooth. Wood white, perishable and of no value.

535 7. **F. Benjamina**, Linn; Fl. Br Ind. v. 508, Bedd. Fl. Syl. ccxxiii, Gamble Man. Tim. 640, Brandis Ind. Tr. 604. Mal. *Velál*.

Leaves 2-4½ in. by 1½-3 in., alternate, entire, broadly ovate-elliptic, abruptly acuminate, narrowed to base, all parts glabrous and shining, lateral nerves very close and straight. Petiole ⅓-1 in. Stipules lanceolate, about ½ in. Aerial roots none. Receptacles in axillary pairs, sessile, globose, smooth, ⅓ in. or ¾ in. diam basal bracts 3, short and broad, Male, gall and female flowers in the same receptacles. Figs blood-red when ripe.

A large umbrageous tree with drooping branches, often epiphytic, not uncommon in the evergreen forests between 1000-3000 ft. Height 70 ft Diam 3 ft. Also found in N. India, Assam, the Western Peninsula and Malay Archipelago, but absent from Ceylon.

Fruit ripens March-May.

Bark brownish-green, very smooth. Wood white, soft and useless.

536 8. **F. Trimeni**, King: Fl. Br. Ind. v. 509. Trimen Fl. Cey. iv. 88. Gamble Man. 638. Brandis Ind. Tr. 604.

Leaves 3-4½ in. by 2-3 in., alternate, entire, oblong-oval, obtuse or acute, base cuneate, all parts glabrous, lateral nerves very numerous, close and straight. Petiole ¾ in., stout. Stipules ½ in., ovate, acuminate. Aerial roots few. Receptacles solitary or in pairs, axillary, sessile, globose, ½-¾ in. diam., smooth, basal bracts 3, small. Male gall and female flowers in the same receptacles. Figs orange or red when ripe, not dotted.

A very large tree said to occur in the forests of Travancore, though I do not know it. Height 70 ft. Diam. 4 ft. Also found in the Western Ghauts and in Ceylon.

Fruits ripen June-Aug.

537 9. **F. retusa**, Linn, Fl. Br. Ind. v. 511, Bedd. Fl. Syl. ccxxiii. Trimen Fl. Cey. iv. 89, Gamble Man. Tim. 643, Brandis Ind. Tr. 603, Tam. *Kal atthi*.

Leaves 2-4½ in. by 1-2½ in., alternate, entire, ovate obtuse with a slight accumination, base more or less narrowed to the petiole, all parts glabrous, coriaceous and shining, lateral nerves 5-8 pairs, larger than the rest, with smaller nerves parallel to them and numerous reticulations between. Petiole stout ¼-½ in. Stipules ⅓-½ in. Aerial roots numerous, but thin. Receptacles in pairs, axillary, sessile, globose, about ⅓ in. diam., smooth, basal bracts 3, broadly ovate. Male gall and female flowers in the same receptacles. Figs greenish-yellow when ripe.

A large evergreen tree, usually epiphytic, found in the forests at low elevations and very often planted along road-sides. Height 60 ft. Diam. 2 ft. Occurs also on the Western Ghauts, in N. India, Ceylon, Burmah and Ceylon, widely distributed.

Fruits ripen April-May.

"Bark brown, fairly smooth. Wood light reddish-grey, moderately hard, with narrow, wavy bands of soft tissue alternating with broader bands of firm texture. Pores moderated-sized, often subdivided, scanty. Medullary rays short, moderately broad." (Gamble.)

W=37 lbs. (average).

Gamble says that the "wood is one of the best of the fig kind." "and might be used for furniture, but that all the fig woods are looked" "upon as useless" Not used in Travancore.

The root and leaves boiled in oil form good applications for wounds and bruises. The juice of the bark has a reputation in liver-disease. (Dict. Econ. Prod.)

10. **F. Talboti,** King. Fl. Br. Ind. v 312, Gamble Man. Tim. 538
638, Brandis Ind. Tr. 603. Tam. *Itthi: kal itthi.*

Leaves 2-4 in. by 1-2 in., alternate, entire, elliptic, elliptic-ovate, apex shortly caudate-acuminate, base narrowed, all parts glabrous, thinly coriaceous and shining above, lateral nerves 6-9 pairs, rather prominent on both surfaces, reticulate beneath. Petiole ¾-1 in. Stipules ovate, ¼ in. No aerial roots. Receptacles in axillary pairs, obovoid, sessile, ¼ in. diam., smooth, basal bracts 3, ovate-acute. Male gall and female flowers in the same receptacles. Figs greenish-yellow, dotted when ripe.

A very large evergreen tree, usually epiphytic, common in the forests about Puliyera and Arienkavu. Height 100 ft. Diam. 2½ ft. Also found on the Western Ghauts in Malabar.

Fruits ripen Sep.-Oct.

Bark ½ in. thick green, very smooth. Wood very white when fresh cut, turning yellow, with very narrow rings of dark and light tissue alternating. Pores large, very few. Rays fine, indistinct.

"W=31 lbs.

The wood is soft and very perishable."

11. **F. nervosa,** Roth; Fl. Br. Ind. v. 512, Bedd. Fl. Syl. 539
ccxxiii, Trimen Fl. Cey. iv. 89, Gamble Man. Tim. 638, Brandis Ind. Tr. 600. Tam. *Nir ál.* Man. *Eeccha.*

Leaves 3-7 in. by $1\frac{1}{2}$-3 in., alternate, entire, often undulate, oblong-lanceolate, apex abruptly acuminate, base narrow, slightly unequal, young parts puberulous, at length all glabrous except the stipules, bright green or red and shining when young, dark green when old, lateral nerves 7-12 pairs, prominent beneath. Petiole $\frac{1}{2}$-1 in. Stipules subulate, $\frac{1}{2}$ in. No aerial roots. Receptacles on $\frac{1}{2}$ in. peduncles, axillary, solitary or in pairs, globose, about $\frac{2}{3}$ in. diam. puberulous, basal bracts none, but at the base of the peduncle are 3 minute bracts. Male gall and female flowers in the same receptacles. Figs reddish-yellow when ripe.

A very handsome umbrageous tree attaining a great size on the banks of the Acchencoil river and elsewhere in the evergreen forests, and ascending the hills to 4000 ft. Height 100 ft. Diam. 5 ft. Found also in N. and S. India, Ceylon and Burmah.

Fruits ripen Dec.-Jan. and Aug.-Sept.

Bark brown mottled with white, smooth. Wood white and soft.

540 12. F. **religiosa**, Linn, Fl. Br. Ind. v. 513, Bedd. Fl. Syl. t. 314, Trimen Fl Cey, iv. 90, Gamble Man. Tim. 644, Brandis Ind. Tr. 601. Eng. *The Peepal tree*. Tam. and Mal. *Arasu*: *arei-al*.

Leaves $4\frac{1}{2}$-7 in. by 3-$4\frac{1}{2}$ in., alternate, entire, edges undulate ovate-rotund, narrowed upwards and the apex prolonged into a long linear tail, base rounded not cordate, sometimes narrowed, all parts glabrous, shining above, 5-7 nerved at base, lateral nerves about 8 pairs, reticulate. Petiole slender, 3-4 in. Stipules minute. Aerial roots none. Receptacles in pairs, sessile, axillary, globose, $\frac{1}{3}$ in diam., basal bracts 3, spreading. Male (often absent) gall and female flowers in the same receptacles. Figs dark purple when ripe.

A large tree usually epiphytic, not indigenous in Travancore, but self-sown and well established in all civilised parts. The tree grows slowly at first, 12 to 15 ft. in height and 3 in. diam. in a dozen years but faster when it has attained 1 ft. in diam. It is often planted in avenues and near temples, and is regarded as sacred by the Hindus. Trees of great age, upwards of 200 years old, are known and venerated.

Fruits ripen Sep.-Oct.

Bark grey, $\frac{1}{2}$ in. thick, smooth. Wood white, moderately hard with alternating bands of soft and harder wood which give it a mottled appearance. Pores medium-sized to large. Rays moderately broad. Gamble gives.

W = 35 lbs.

Gamble says that the wood is used for packing-cases and for fuel, and occasionally for charcoal. The leaves, bark and fruit are used in native medicine, and the bark gives a tenacious milky juice which hardens into a substance resembling "guttapercha." The tree is easily propagated by seeds or cuttings. Elephants are very fond of the bark and leaves.

13. F. **Arnottiana,** Miq, Fl. Br. Ind. v. 513, Bedd. Fl. Syl. ccxxii, Trimen Fl. Cey. iv. 90, Gamble Man. Tim. 638, Brandis Ind. Tr. 602. Mal. *Ama kanni an.* 541

Leaves 3-8 in by 2-5 in., alternate, entire, slightly undulate, broadly ovate, narrowed upwards to the caudate-acuminate apex, base truncate or deeply cordate, never narrowed, all parts glabrous, bright green above. paler beneath, basal nerves 7, lateral nerves 5-7 pairs. Petiole red, slender, 3 6 in Stipules reddish-green, 1-2 in. Aerial roots none. Receptacles sessile or on short peduncles, in pairs or clustered, axillary or above old leaf-scars, $\frac{1}{4}$-$\frac{1}{3}$ in. diam., globose, basal bracts 3. Male gall and female flowers in the same receptacles. Figs purple dotted with green when ripe.

A pretty little much branched tree always found in rocky places, common in deciduous forests up to 3000 ft. Height 80 ft. Diam. 1 ft. Found in S. India and Ceylon.

Fruits in July and August.

Bark pale and smooth. Wood white.

14. F. **Tjakela,** Barm, Fl. Br Ind. v. 514, Trimen Fl. Cey. iv. 91 Gamble Man. Tim. 645, Brandis Ind. Tr. 603 Mal. *Kár ál.* 542

Leaves 3-7 in by $1\frac{1}{2}$-$2\frac{1}{2}$ in., alternate, entire, slightly undulate, oblong-lanceolate, 3-5 nerved, all parts glabrous, red, yellow or pale green when young, at length dark green and shining, lateral nerves 7-10 pairs. Petiole 2-4 in., slender. Stipules small. $\frac{2}{3}$ in No aerial roots. Receptacles in clusters of 2-6 crowded on the branches, sessile, globose, 1/5 in. diam., basal bracts 3, bifid. Male gall and female flowers in the same receptacles. Figs dull grey-purple when ripe with pale spots.

A much branched deciduous tree, very common on all waste land from 0-30 0 ft., often epiphytic. Height 50 ft. Diam. $1\frac{1}{2}$ ft. Common in S. India and Ceylon. Easily distinguishable by its small receptacles in clusters and its very glistening, grey-green leaves.

Fruits ripen June-July.

Bark dark brown rather rough. Gamble says that the wood is brown, soft, with alternate, concentric rings of soft and firm tissue. Pores large scanty, scattered. Rays fine, dark wavy, not numerous and he gives.

W = 30 lbs.

Not used in Travancore except as an avenue tree.

15. F. **Tsiela,** Roxb, Fl. Br Ind. v. 515, Bedd. Fl. Syl ccxxiii, Trimen Fl. Cey. iv. 92, Gamble Man. Tim. 645. Brandis Ind. Tr. 603. 543

Leaves 2-4½ in. by 1-2 in. alternate, entire, ovate or ovate-oblong, acute, base narrowed or rounded, 3-nerved lateral nerves 8-10 pairs. Indistinct, all parts glabrous, petiole 1-2 in. Stipules ⅛-1 in. ovate. No ærial roots. Receptacles in axillary pairs, crowded towards the ends of the branches, sessile, globose, smooth, ⅓-⅔ in. diam., basal bracts 3, minute. Male gall and female flowers in the same receptacles. Figs purple when ripe.

A very large umbrageous tree, not common in Travancore but noticed by me at Cumbum mettu on the Cardamom hills, and at Knandal on the High Range. Height 80 ft. Diam. 4 ft. Occurs through S. India especially in the drier parts, and in Ceylon and planted as an avenue tree there.

Fruits ripen Dec-Jan.

" Bark greenish-grey, smooth. Wood grey, soft to moderately "
" hard, with alternate bands of soft and hard tissue. Pores very "
" scanty, large conspicuous on a vertical section. Medullary rays "
" fine, equidistant."

W=34 lbs.

Not used in Travancore.

544 16. **F. infectoria**, Roxb; Fl. Br. Ind. v. 515; Bedd. Fl Syl. ccxxii, Trimen Fl Cey. iv. 92. Gamble Man. Tim. 645. Brandis Ind. Tr. 602. Mal. *Che'rla*.

Leaves 2-7 in. by 1-4 in., alternate, entire, oblong-ovate, shortly acuminate, base rounded or emarginate, rarely narrowed. 3-nerved, lateral nerves 5-7 pairs, distinct, all parts glabrous. Petiole 1½-2 in. Stipules ½ in., broadly ovate, pubescent. Aerial roots few. Receptacles sessile or shortly pedicellate in axillary pairs, globose, ¼-⅓ in. diam., basal bracts 3, minute. Male gall and female flowers in the same receptacles. Figs white flushed with pink when ripe.

A large tree leafless for a short time found in the evergreen forests at low elevations, common, often epiphytic. Height 70 ft. Diam. 4 ft. Found through India, Ceylon and Burmah.

Fruit ripens in Sep.-Nov.

Bark ⅜ in. thick, greenish-grey, smooth. Wood grey, moderately hard with concentric bands of soft tissue alternating with broader bands of firmer tissue. Pores large, scanty. Rays uniform, moderately broad. Gamble gives

W=34 lbs.

and he says that " the wood is sometimes used for charcoal, not "
" otherwise. The young shoots are eaten in curries and the leaves "
" make good elephant fodder, while the bark gives a fair fibre."

545 17. **F. callosa**, Willd, Fl Br. Ind. v. 516; Bedd. Fl. Syl. ccxxiv, (under *F. cinerascens*). Trimen Fl Cey. iv. 93; Gamble Man. Tim. 646, Brandis Ind. Tr. 601. Tam. *Koli-ál*.

Leaves 4-10 in. by 3-5 in, alternate, entire, ovate-oblong, apex rounded or shortly acuminate, base broad, rounded or narrowed, lateral nerves 5-12 pairs, pubescent when young, scabrid when mature,

dark green, smooth and shining above, pale beneath. Petiole 1-1¾ in. Stipules pubescent, ½ in. No aerial roots. Receptacle-pubescent-scabrid, subglobose, 1 in, diam., solitary in the leaf axils on ⅝ in. peduncles, basal bracts 3, pubescent, large, spreading. Male (usually diandrous gall and female flowers in the same receptacles. Fig greenish-yellow when ripe.

A very large erect tree with dark foliage sometimes mistaken for Anjili, common on abandoned land up to 2000 ft. Height 80 ft. Diam. 2 ft. Found also in S. India, Ceylon, Burmah and the Malayan Archipelago.

Fruit ripens July-August, and in Dec.

Bark smooth, grey. Wood white, useless.

18. F. **asperrima** Roxb; Fl Br. Ind. v. 522; Bedd. Fl. Syl. ccxxiv; Trimen Fl. Cey. iv. 94; Gamble man. Tim. 647, Brandis 546
Ind. Tr. 605. **Eng.** *The Sandpaper tree.* Tam. *Maram-thinni-atthi* Mal. *Théragam.*

Leaves 4-6 in. by 1-2½ in., alternate, toothed or deeply lobed, ovate or oblong-lanceolate, cuspidate, base obtuse or rounded, scabrid and hispid on both surfaces, strongly reticulate beneath, lateral nerves 3-5 pairs, basal pair prominent. Petiole stout 1½-2 in. Stipules minute. Aerial roots none. Receptacles solitary or in pairs, peduncled, globose, ½-¾ in diam., basal bracts none, but 3 small bracts at the base of peduncle. Male and gall flowers in one set of receptacles. female in another set. Figs purplish-yellow when ripe, scabrous-hispid.

A very common tree occurring in secondary forest at all elevations from 0-4000 ft. Height 60 ft. Diam. 2 ft. Occurs through Central, Western and Southern India and Ceylon.

Fruits ripen April-May.

Bark smooth, pale, ¼ in. thick. Wood greyish-white, soft and perishable, with concentric bands of pale and darker tissue alternating. Pores medium sized to large often divided, abundant in spring-wood, fewer in autumn-wood, Rays moderately equidistant and uniform. Annual rings marked by more numerous pores 2 to inch

W = 24 lbs. P. = 245.

The leaves are used instead of sand paper for polishing furniture.

19. F. **hispida,** Linn. Fl. Br. Ind. v 522. Bedd. Fl. Syl. 547
ccxxiv. Trimen Fl. Cey iv. 94. Gamble Man. Tim. 647. Brandis Ind. Tr. 606. Tam. *Péi atthi : chona-atthi : ottanáli.* Mal. *Erumanákku.*

Leaves 4-12 in by 2-5 in. opposite, entire or toothed above the middle, ovate oblong, cuspidate or caudate, base rounded, 3-nerved at base, lateral nerves 3-5 pairs, strong, very rough on both surfaces, with short, stiff hairs. Petiole 1-2 in. (up to 3½ in on young shoots), densly hispid. Stipules ovate-lanceolate. pubescent. Aerial roots none. Receptacles on stout peduncles, axillary or fascicled, on leafless often very long shoots from the old wood, about 1 in. diam., hispid, basal bracts 3. Male and gall flowers in the same receptacles, female in separate receptacles. Figs pale green when ripe, very hispid.

A small tree with a weak stem often sending up numerous shoots, very common in secondary forest everywhere from 0-4000 ft. Height 30 ft. Diam. 8 in. Occurs throughout India, in Ceylon, and the Malay Archipelago.

Fruit ripens Jan-Feb.

Gamble says that the bark is 15 in. thick, grey, rough, peeling off in irregular flakes. Wood soft, dirty grey, with regular concentric bands of soft tissue alternating with firmer bands of darker tissue. Pores scanty, moderate-sized. Rays moderately broad and fine, and he gives

W = 30 lbs. (average). P = 360.

The wood is useless,

548 20. **F glomerata**, Roxb. Fl. Br. Ind. v. 535. Bedd. Fl. Syl. ccxxiv. Trimen Fl. Cey. iv. 96. Gamble Man. Tim. 650. Brandis Ind. Tr. 609. Tam. and Mal. *Atthi*.

Leaves 4-7 in. by $1\frac{1}{2}$-$2\frac{1}{2}$ in., alternate, entire, oblong ovate or lanceolate, tapering to an obtuse apex, base obtuse, young shoots pubescent, mature leaves glabrous, rather light green, paler beneath, lateral nerves 4-8 pairs, strong beneath. Petiole $\frac{3}{4}$-2 in. Stipules $\frac{1}{2}$-$\frac{3}{4}$ in., linear-lanceolate. Aerial roots none. Receptacles sub-globose $1\frac{1}{4}$ in. diam. on short peduncles clustered on short branches on the trunk and larger branches, basel bracts 3, triangular. Male flowers (usually diandrous) in the same receptacles with gall flowers, female flowers in separate receptacles, or all together in the same. Figs downy, orange, pink or dark crimson,

A large deciduous tree, losing its leaves about August but giving a beautiful shade in the hot weather, common from sea-level to 4000 ft. Height 60 ft. Diameter 2 ft., but in old trees sometimes 8 or 10 ft. There are some very old trees at Mekkarei in the Shencottah Taluk on the old road to Achencoil, the largest of which is 28 ft. in circumference with a very irregular trunk. Found all over India, Ceylon and Burmah.

Fruit ripens Sep.-Nov.

Bark grey, smooth, $\frac{2}{3}$ in. thick. Wood brownish-grey, soft and coarse, with alternate bands of loose and firmer tissue. Pores large, often divided conspicuous on a longitudinal section. Rays moderately broad and fine, easily seen. Annual rings none. Gamble gives

W = 30 lbs.

"The wood is not durable but it is said to last well under water" "and to be good for well-frames. The juice is made into bird-lime" "and the leaves, bark and fruit are used for native medicine. The" "fruits are edible but usually too full of insects." (Gamble). It is the best shade tree for coffee, grows fast and is easily propagated by cuttings.

2. ARTOCARPUS, Forst.

Evergreen trees with milky juice and alternate, entire, lobed or pinnatifid, penniveined leaves. Flowers monœcious, crowded together, male in catkin-like spikes, female on globose or oblong receptacles, generally with peltate bracteoles. Male flowers :—perianth

2-4 lobed, stamen 1, pistillode absent, female flowers :—perianth tubular, base confluent with the receptacles, mouth minute, ovary straight, ovule pendulous. Fruit fleshy,, globose or cylindrical, consisting of a large number of fleshy perianths, with or without seeds, sunk in the receptacle.

Fruit spinous ; stipules amplexicaul ... 1. *A. hirsuta.*
Fruit tubercled ; stipules amplexicaul ... 2. *A. integrifolia.*
Fruit smooth ; stipules not amplexicaul ... 3. *A. Lakoocha.*

1. **A. hirsuta**, Lamk., Fl. Br. Ind. v. 541. Bedd. Fl. Syl. t. 549
308. Gamble Man. Tim. 652. Brandis Ind. Tr. 611. Tam. *Anjili* Mal. *Avani*.

Leaves 4-10 in. by 3-5 in., entire in mature trees, deeply lobed in young plants and coppice-shoots, broadly ovate, acute, base narrowed, glabrous and dark green above, veins beneath 7-11 pairs. prominent covered with long yellow hairs as are also the petioles, peduncles stipules and young shoots. Petiole $\frac{3}{4}$-1 in. Stipules lanceolate, $\frac{3}{4}$-1 in. Flowers yellowish-green, small. male in heads 3-4 in. long and $\frac{1}{3}$ in. diam., cylindrical, erect on 1-in. axillary peduncles, bracteoles chaffy female in erect ovoid heads $1\frac{1}{2}$ in. long on $1\frac{1}{2}$ in. peduncles. Fruit bright yellow, ovoid or globose, 3 in. diam., covered with spines $\frac{1}{4}$ in. long. Seeds ovoid, white $\frac{3}{4}$ in. long.

A magnificent tree with a straight clean stem and dense foliage, abundant in the evergreen forests from sea-level to 3,000 ft and often planted. Height 150 ft, Diam. 4 ft. Confined to Malabar and the Western Coast.

Flowers Dec.—March. Fruit ripens May—June.

Bark smooth, grey, $\frac{1}{2}$ in. thick. Wood moderately hard ; sapwood white, heartwood yellowish-brown, durable seasons and polishes well. Pores large, often divided, often filled with a yellowish deposit. Rays fine to moderately broad, very distinct, few and wavy. Annual rings indistinct.

W=35 lbs. P=573 (Gamble gives P=644).

The growth of Anjili is slow at first, but when the tree has once obtained a good hold of the ground its growth becomes rapid. Trees measured at Malayattur showed an average growth of 30 ft. in height and 15 inches girth in 5 years. At 10 years old the girth was $33\frac{1}{2}$ in. and at the last measuring when the tree was 14 years old the girth was 40 in. Yearly measurements of trees in other places show an increase in diameter of about 1 in. per year. This is equivalent to 2 rings per inch of radius. The Anjili tree is a strong shade-bearer, but it will grow equally well out in the open. The tree seeds freely every year, and the seeds are easily procurable, but ripe fruit should be obtained rather than clean seeds, for in some villages the seeds are boiled for oil, and they are of course useless for germination after being subjected to this process. Seeds should be sown at stake as the seedlings are difficult to transplant. Monkeys are very fond of the seed, as also of the young shoots. A whole sowing of Anjili over 8 or 10 acres was completely destroyed one year by monkeys, before we had realised that watchers were necessary. In the forest it is often found in company with "White cedar" with an undergrowth of cardamoms, the same conditions suiting all three.

The Anjili is one of the most valuable trees in Travancore, and one which would probably pay as well to grow as teak. The wood does not warp or crack, it is not eaten by white ants, and it is straight-grained, durable and easily worked, and the timber can be obtained of large size. Lastly, as I have shown, the tree grows fast. The wood is extensively used locally for the panelling and flooring of houses, but its chief use is for boat-building. Boats are hollowed out from the tree-trunks and surpass all others in durability, a good boat lasting with care 30 or 40 years. There is a great demand for planks for export to A abia for the construction of boats and small vessels, and in Travancore the practice of building boats is slowly replacing the more wasteful practice of hollowing them out. Elephants are very fond of the bark and leaves.

The quantity of Anjili felled from Government forests averages about 10,500 cub. ft. a year, and private compounds supply much.. Ten years ago the price was Rs. 10 yer candy. It is now worth
550 about 18 rupees, or 1 rupee 2 annas per cub. ft.

2. A. **integrifolia**, Linn; Fl. Br. Ind. v, 541; Bedd. Fl. Syl. ccxix; Trimen Fl. Cey. iv. 99; Gamble Man. Tim. 652; Brandis Ind. Tr. 611. Eng. *The Jack tree*. Tam. and Mal. *Pilavu, pilá*.

Leaves 4-9 in. by 2½-5 in. entire in mature trees, lobate in saplings ovate, oblong, acuminate, base acute, coriaceous very dark green, glabrous and shining above, rather hirsute and yellowish beneath, nerves 7-8 pairs. Petiole ½-1 in. Stipules large, glabrous, sheathing caducous. Flowers yellowish-green, very numerous; male sessile on short-peduncled cylindric receptacles 2-4 in. by 1-1½ in.; female sessile on oblong-ovoid receptacles. Fruit tubercled, borne on the stem and larger branches, yellowish-green, from 1-1½ ft. long, containing a large number of pale brown smooth ovoid seeds 1¼ in. long each surrounded by a yellow pulp.

A large forest tree fairly common in evergreen forest at elevations between 1,500-4,000 ft. and much planted throughout the country. Height 80 ft. Diam. 2 ft. Occurs also in the forests of Malabar.

Flowers Feb.—March. Fruits April—June.

Bark smooth, mottled green and black, ¼ in. thick. Sapwood pale, about 2 in. Heartwood bright yellow, sometimes mottled, darkening with exposure to an orange-brown, moderately hard, polishing well. Pores medium-sized to large, often filled with a pale yellow substance, and each surrounded by a ring of soft tissue. Rays rather broad, very conspicuous. Annual rings indistinct.

W = 39 lbs. P = 793.

The growth of the Jack tree is slow at first, but later it becomes more rapid, yet it does not grow quite so fast as the Anjili. Trees planted at Malayattur showed a girth of 1½ in. at 6 years, 29 in. at 10 years, and 37 in. at 14 years, equivalent to between 2 and 3 rings per inch of radius. The tree bears shade well and grows on almost any soil, but it prefers a deep red loam.

The wood does not warp or split and it is easily worked. It is very largely used for furniture, the wood being obtained from cultivated trees which often attain an immense girth, and in old trees the wood is often beautifully marked and knotted.

The fruit which is called "chakka" (from which the English name is derived) is the most valuable part of the tree, as it supplies food to many classes of the people when it ripens. The pulp surrounding the seeds is not unlike the fruit of the melon, but it has a very strong odour, which most Europeans dislike. The large seeds are not unlike chestnuts and are highly nutritious. A yellow dye can be obtained by boiling the wood or its sawdust: it is then fixed by alum. All parts of the tree yield a milky juice which may be used as a bird-lime or as cement. Elephants like the bark and leaves and are attracted by the fruit.

There is a large trade in jackwood cut from private compounds, but none is taken from the forests, the tree being rather local. The value of the wood is about 1 Rupee per c. ft., but wide planks fetch double that sum.

3. A. **Lakoocha**, Roxb. Fl. Br. Ind. v. 543. Bedd. Fl Syl. ccxix. Trimen Fl. Cey. iv. 99. Gamble Man. Tim. 655. Brandis Ind. Tr. 612. Mal. *Chima : thitti-pilávu.* 551

Leaves 4-10 in by 2-5 in., oblong or obovate, obtuse, cuspidate base rounded or cordate, usually entire, dark green, glabrous and shining above softly pubescent beneath nerves 6-1? pairs, prominent. Petiole ½-1 in. Stipules ½ in., lanceolate, tomentose. Flowers yellow, male in globose heads ½-1½ in. diam., female in heads rather larger. Fruit 2-4 in. diam., irregularly globose, smooth, yellow, containing a few broad flat seeds.

A large tree thinly scattered through the evergreen forests between sea-level and 2,000 ft. Height 120 ft. Diam. 3 ft. Found through India, Ceylon and Burmah.

Flowers Jan.—Feb. Fruits April—May.

Bark rough, purple, ½ in. thick. Sapwood white, soft and perishable. Heartwood yellowish-brown, smooth, even-grained, moderately hard. Medium fibre. Pores large, scanty, often filled with a white substance. Rays of medium size and fine, distinct but distant. Annual rings marked by lines of darker wood, 3 to 4 rings per inch of radius.

W=43 lbs. P=577.

The wood is used in Travancore for house-building and for boats, but it is not sufficiently common to be well known. Gamble says that it is highly prized in the Andamans and it is easy to plane but difficult to saw on account of a resinous substance. It is used for building and furniture and is not eaten by white ants. The fruit is eaten by our jungle tribes. Gamble mentions that it is on sale in the bazaars of Dehra Dun and elsewhere and that the tree is cultivated for its fruit. "The fruit yields a yellow dye. Wood used in dyeing cloth yellow" (Dict. Econ. Prod.) The bark is eaten instead of betel nut.

4. PLECOSPERMUM, Trecul.

Trees spinous or not, with alternate, entire, penniveined leaves and minute stipules. Flowers diœcious in globose, axillary heads: male closely packed, female confluent into an anthocarp. Male flowers;—perianth 4-lobed, lobes imbricate, stamens 4, pistillode slender; female flowers;—perianth 4-toothed, ovary straight, ovule pendulous. Fruit an irregular fleshy syncarpium enclosing one or few seeds.

552 **P. spinosum**, Trecul.; Fl. Br. Ind v. 491; Bedd. Fl. Syl. ccxx Trimen Fl. Cey. iv. 103, Gamble Man. Tim. 634, Brandis Ind. Tr. 614.

Leaves 2-3 in. by 1-1½ in. oval-oblong, acute or obtuse, base sub-acute, hard, shining. Petiole ⅙-⅓ in. Flowers greenish, male minute subsessile, pubescent, in heads ⅓ in. diam., female flowers pubescent in larger heads ½ in. diam. Fruit ½ in. diam.

A shrub or small tree with stout, axillary spines, not seen by me but found by Lawson in S. Travancore. Occurs through India and in Ceylon, chiefly in the drier parts.

Flowers Feb.—April (in Ceylon).

Bark thin, orange-coloured, peeling off in thin, brittle flakes. Wood greyish white with a small bright orange-yellow heartwood, which is very hard. Pores from small to large, joined by wavy, more or less concentric bands of soft tissue. Rays fine and very fine, wavy (Gamble).

W = 50 lbs.

Gamble mentions that the wood is used in the Darjeeling Terai to give a yellow dye and that the growth is slow, 12 rings per inch of radius.

4. ANTIARIS, Leschen.

Trees with milky juice and alternate, penniveined, simple leaves stipules small, connate, caducous. Flowers monœcious, male crowded on the surface of a receptacle, surrounded by bracts female minute, solitary in a pyriform involucre of many bracts. Male flowers sepals 3-4 imbricate, stamens 3-8, erect. Female flowers,—perianth none, ovary adnate to the involucre, style-arms 2, ovule pendulous. Fruits fleshy.

A. toxicaria,* Leschen, Fl. Br Ind. v. 537. Bedd Fl Syl. t.
553 307 (under *A innoxia*), Trimen Fl. Cey iv. 97, Gamble Man. Tim. 651, Brandis Ind Tr 614. Eng. *The Upas tree.* Tam. *Mara-uri: aranthelli.* Mal. *Arei-anjili: aranjelli.*

Leaves 4-8 in. by 2-3 in., oval-oblong, acuminate, base rounded or cordate, entire or serrulate, scabrous on both sides, nerves 8-10 pairs. Petiole ⅛ in. or none. Flowers small, male on ½ in axillary, peduncled receptacles, female involucre sessile. Fruit scarlet, pyriform ½-¾ in. diam., 1 seeded.

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* It is stated in the Fl. Br Ind. 'that this tree is an evergreen. This is a mistake. It loses its leaves in the S. W. Monsoon and remains bare at a time when all the other trees of the forest are in fine foliage.

A very lofty deciduous tree attaining a height of 150 ft. (250 ft. according to Beddome and Brandis), and a diameter of 5 ft. fairly common in our evergreen forests from sea-level to 2,000 ft. and easily recognizable as it remains a long time without leaves. Occurs through S. India, Ceylon and Pegu.

Flowers Sep - Oct. Fruits Jan—May.

Bark brownish-grey, smooth. $\frac{2}{3}$ in. thick. Gamble says that the wood is white, soft and even-grained. Pores large and moderate-sized. Rays moderately broad, undulating and uniform. Annual rings faint and he gives·

W=24 lbs.

The Indian tree was at one time supposed to be distinct from the Upas tree of Java, on account of its innocuous character, but it is now generally admitted by botanists that the two trees are the same. The milk of the Upas tree contains an acrid, virulent poison, called antiarin, which is used in Java for poisoning arrows, but its properties do not seem to be known in India. Some writers state that the effluvium of the juice, especially when a tree is felled, causes a kind of cutaneous eruption, but I have never heard of such a thing in Travancore. The poisonous properties of the juice have given rise to exaggerated accounts of the fatal effects produced by the tree. It has been said that the effluvium kills all animals and birds which approach it, that no fish are to be found in the waters in its neighbourhood, and lastly, that any attempt to collect the juice is almost certainly followed by the death of the operator. (Dict. Econ. Prod-)

The wood is soft and perishable. It has been used as a substitute for cotton-wood for tea-boxes, but it is neither so straight-grained nor so easy to work as the latter. The inner bark gives a good fibre and the bark itself is often used by the hill-tribes to make sacks and bags of different sizes. To do this, a tree of suitable size is felled and a length of from 1-3 ft. long is cut off. The bark is then beaten with a piece of wood, when it opens out and can be rolled back and thus removed from the wood. One end is then sewed up and it is ready for use. The growth is fast, 4 to 6 rings per inch of radius (Gamble).

5. STREBLUS, Lour.

Unarmed trees with milky juice and alternate, scabrid, penniveined leaves and subulate stipules. Flowers diœcious or monœcious. Male minute, subsessile in globose heads, sepals 4, imbricate-stamens 4, pistillode short: female larger, 1-3 together, sepals 4· unequal, ovary straight, styles 2, ovule pendulous. Fruit a subglobose achene, enclosed in the enlarged fleshy sepals, one-seeded·

S. asper. Lour., Fl. Br· Ind. v. 489, Bedd Fl. Syl. cxxi, 554 Trimen Fl. Cey. iv 101, Gamble Man. Tim 632, Brandis Ind. Tr. 615. Tam. *Pira.* Mal. *Parava.*

Leaves 1-4 in. by $\frac{1}{2}$-2 in, ovate or rhomboid, acute, coarsely toothed from below the middle, base acute rough on both sides with minute raised dots, dark green above, pale beneath, nerves prominent

beneath. 4-6 pairs. Petiole very short. Flowers greenish-yellow, male 5 or 6 together in axillary heads, female on slender pedicels. Fruit a yellow, one-seeded berry the size of a pea.

A small evergreen tree found in compounds and hedges all through the low country, common. Height 30 ft. Diam. 1 ft. Occurs throughout India, Ceylon and Malaya.

Flowers Feb.—March. Fruits April—May.

Bark $\frac{1}{3}$ in. thick, soft, light grey. Wood white, moderately hard, no heartwood nor annual rings. Pores small in irregular belts of soft tissue alternating with broader belts of firm tissue. Rays fine to moderately broad, few (Gamble).

W=40 lbs. P=587 (Gamble's average).

The wood is said to be tough and elastic and to be sometime used for cart-wheels, but the tree is difficult to cut. It coppices well and is said to give a fair firewood. The bark is used for paper-making, and the twigs for tooth-brushes. The rough leaves are used to polish wood and ivory and as elephant-fodder. The fruit is edible (Gamble). The juice has astringent and antiseptic properties and is used to remove glandular swellings: it is also employed as a vegetable rennet to coagulate milk. The bark in decoction and the powdered roots are given for fever and dysentry (Dict. Econ. Prod.)

ORDER LXVIII. URTICACEÆ.

Trees with watery juice and alternate, simple, entire, serrate or dentate, stipulate leaves. Flowers unisexual, male sessile in compact heads or clusters, sepals 3-5, stamens 3-5 opposite the perianth-segments; female-perianth campanulate, free, ovary compressed, 1-rarely 2-celled, ovule erect. Fruit usually fleshy.

An Order containing a number of stinging and harmless herbs but only 3 small trees indigenous in Travancore. The fibre of several species is tenacious and suitable for making cloth or paper.

Branchlets, petioles and inflorescence armed with stinging hairs . 1. *Laportea.*

No stinging hairs

Leaves green beneath : female flowers surrounded by fleshy bracteoles . 2. *Villebrunea.*

Leaves white or grey beneath : female flowers naked . 3. *Debregeasia.*

1. LAPORTEA, Gaudich.

Small trees with stinging hairs and large penniveined leaves ; stipules opposite, free or connate. Flowers diœcious in axillary cymes Male flowers :—sepals 4-5, subvalvate, stamens 4-5, pistillode short. Female flowers.—sepals 3-4, free or connate, ovary compressed, style filiform. Fruit an oblique achene.

555 **L. crenulata.** Gaud Fl. Br. Ind. v. 550; Bedd. Fl. Syl. t. 306, Trimen Fl. Cey. iv. 105, Gamble Man. Tim. 656, Brandis Ind. Tr. 616. Eng. *The Mousa Nettle.* Tam. *Otta. pilávu.* Mal. *Aná-choriya.*

Leaves 5-12 in. by 2-4 in., oblong-lanceolate, acute or acuminate, crenate towards the apex or quite entire, base narrowed or obtuse, bright green, glabrous and shining above, paler beneath, nerves 12-16 pairs. Petiole stout, 1-4 in. Stipules small. Flowers pale green, small, in dichotomously branched cymes. Achene small black and shining.

A large shrub or small tree up to 25 ft. high and 6 in. diam, common in all our evergreen forests from 1,000 to ,000 ft. and usually found growing on rocks or moist hollows with light soil. Found through India, Ceylon and Malaya.

Flowers Jan.-Feb.

Bark white, smooth, very thin. Wood pale brown, very soft, separating when dry into concentric layers without cohesion. Pores large rays indistinct.

This is the worst of the stinging nettles of India, its minute stinging hairs causing acute pain to any one touching one of its leaves. All observers have noted how much the pain is aggrevated when the part stung is dipped into water, and this I can myself confirm. Fortunately, the tree is easily recognizable, and it is not widely distributed through the forests, but is only found in suitable situations. Hooker says in his Himalayan journals that the sting of this plant is only poisonous in autumn. It yields a strong useful fibre, used by the hill-tribes of Assam for cordage and in the manufacture of a coarse cloth, but it is inferior to Rhea fibre (Dict. Econ. Prod).

2. VILLEBRUNEA, Gaud.

Trees with petioled, penniveined leaves and bifid stipules. Flowers minute, diœcious in axillary, compact heads Male flowers.—sepals 4, valvate, stamens 4, pistillode clavate. Female flowers —base surrounded by fleshy bracts, perianth tubular, 4-5 toothed ovary adnate to the perianth, stigma plumose. Fruit furrowed, seated in a fleshy cup.

V. integrifolia, Gaud; Fl. Br. Ind. v. 589; Bedd Fl. Syl. 556
ccxxv. (under *Oreocnide sylvatica*); Trimen Fl. Cey. iv. 118; Gamble Man. Tim. 659, Brandis Ind. Tr. 618.

Leaves 4-8 in. by $1\frac{1}{2}$-$2\frac{1}{4}$ in., oblong-lanceolate with a long acumination, base obtuse or acute, entire at the base, crenulate near the apex, glabrous above, pubescent on the nerves beneath, nerves 5-8 pairs. Petiole $\frac{1}{2}$-$1\frac{1}{2}$ in. Stipules clothed with long hairs. Flowers minute, greenish white, sessile in forked cymules about $\frac{1}{2}$ in. long. Fruit white.

A small much-branched tree throwing up numerous stems, common along the edges of the evergreen forest and in secondary forest at 1,000-3,000 ft. Height 25 ft. Diam 5 in. Found throughout the moister parts of India, Ceylon and Burmah.

Flowers and fruits Jan.-Feb. and Sep.-Oct.

Bark brown, thin, smooth. Wood white, soft and perishable Pores medium-sized to large, scanty. Rays few, moderately broad.

The wood is useless, but the bark yields a strong fibre which is said to be extensively used in the Himalayas and Assam to make ropes, nets, and coarse cloth. It is called *ban-rhea* by the Assamese, (Dict. Econ. Prod.)

3. DEBREGEASIA, Gaud.

Small trees with rough serrate leaves, ashy-white beneath, base 3-nerved, and bifid stipules. Flowers monœcious or diœcious, the male clustered, the female in small heads. Male flowers:—sepals 3-5, valvate, stamens 3-5, pistillode oblong, base woolly. Female flowers :—perianth tubular, dilated below, 4-toothed, ovary adnate to the perianth, ovule solitary, stigma tufted. Fruit a head of small achenes.

557 **D. velutina,** Gaud , Fl. Br. Ind. v. 590. Bedd. Fl. Syl. ccxxvi (under *Morocarpus longifolius*) , Trimen Fl. Cey. fv 119 , Gamble Man, Tim. 660 , Brandis Ind. Tr. 618. Tam. *Káttunocchi*.

Leaves 4-7 in. by 1-1½ in. lanceolate, acuminate, base rounded or cuneate, serrulate. rugose, prominently reticulated and dark green above, snow-white and pubescent beneath. Petiole ½-1 in. Flowers greenish-white, minute. Heads of fruit ⅓ in. diam orange-red, composed of several small achenes.

A very common much-branched tree occurring from 1,000-4,000 ft. and usually found growing on rocky ground in secondary forest. Height 20 ft. Diam. 4 in. Occurs through India, Ceylon and Burmah in the wetter parts.

Flowers and fruits Jan -March.

Gamble says that the bark is thin, greyish-brown and rough. Wood reddish-brown, hard. Pores moderate-sized, scanty ; annual rings marked by a line of closer pores. Rays moderately broad, uniform. Growth fast. 4 rings per inch of radius, and he gives.

W=34 lbs.

The wood is only used for charcoal, but the fibre from the bark is made by the hill-men into fishing-lines. It is said to withstand the action of water better than the fibre of any other plant. A sample of this fibre sent to England from the Wynad was valued at £ 70 per ton. (Dict. Econ. Prod).

Order LXIX.—MYRICACEÆ.

Glandular and aromatic trees with alternate, simple, entire, or serrulate leaves, stipules none. Flowers unisexual in cylindrical catkin-like spikes Male catkins solitary, fascicled or panicled occasionally with female flowers at the top : female catkins axillary Male flowers —perianth none stamens 2-16, in the axils of lateral bracts. Female flowers , perianth none, ovary 1-celled surrounded by glandular bracteoles, stigmas 2, sessile. Fruit a hard-shelled nut with a fleshy or waxy pericarp.

This small Order contains only one trees indigenous in Travancore. Several species of this genus in other countries yield vegetable

wax which forms the outer covering of the fruit, such as *M. cerifera* the "Wax myrtle" of N. America, *M. cordifolia* the "Candleberry" of S. Africa, and *M. arguta* of S. America.

1. MYRICA. Linn.

Characters of the Order.

M. Nagi, Thunb., Fl. Br. Ind. v. 597, Gamble Man. Tim. 664, Brandis Ind. Tr. 620. 558

Leaves 3-8 in. by 1-2 in., lanceolate or oblanceolate, obtuse or acute, narrowed to base, entire or serrulate towards tip tip, young leaves sharply serrate, underside pale or rust-coloured with numerous resinous dots, young parts pubescent. Petiole very short, Male catkins cylindrical, $\frac{1}{4}$ in. long, sessile in drooping racemes. Female catkins slender, style red. Fruit a sessile, red-purple, ovoid drupe, $\frac{3}{4}$ in. long, glabrous when ripe, with scanty reddish pulp containing a rugose nut.

A moderate-sized evergreen tree up to 30 ft. high found by Lawson in the dry forests of S. Travancore, not seen by me. Occurs also in N. India, Assam and Malaya.

Flowers Oct.—Dec. Fruit ripens in May (in N. India.)

Gamble says that the bark is brownish grey and rough. Wood purplish-grey, hard, close-grained but apt to warp. Annual rings marked by a belt of firmer texture without pores in the autumn wood. Pores very small. Rays numerous, fine, and very fine, and he gives

W=48 lbs (average).

"The wood is not used. The fruit is eaten, it is pleasantly acid and is made into sherbet. The bark is the most valuable product of the tree, it is exported to the plains, used as an aromatic stimulant, and externally as a plaster against rheumatism" (Gamble.) It is used for tanning, and is one of the best of Indian bark dyes, the colour produced being yellow.

ORDER LXX—CASUARINACEÆ.

Leafless trees with cylindrical jointed branchlets, the internodes terminating in a short sheath of connate, subulate scales (leaves). Flowers unisexual, males in terminal spikes, formed of short-toothed cups, female in ovoid heads mixed with bracts. Male flowers,—sepals 1 or 2, stamen 1, anther large. Female flowers —ovary minute, 1-celled, style 2-fid, arms filiforms, ovules 2, collateral. Fruit an oblong cone formed of the hardened bracts and bracteoles forming cavities containing the winged seeds.

An Order containing only one tree common in Travancore and this is not indigenous. The other species are chiefly Australian.

I. CASUARINA, Forst.

Characters of the Order.

C. equisetifolia, Forst, Fl. Br. Ind. v. 598, Trimen Fl. Cey. iv. 120, Gamble Man Tim. 665. Brandis Ind. Tr. 620. Eng. *The Casuarina* or *Beefwood tree.* Tam. *Chauku* Mal. *Sampirani.* 559

Leaves none, branchlets filiform, deciduous. cylindrical of slightly angled. Flowers diœcious, * male minute in brown, pendulous spikes 1-1½ in. long terminating the branchlets; female in small ovoid spikes at the ends of lateral branchlets, one flower under each tooth of the annular sheath, crowned by a reddish-purple, filiform, branched style. Cone ¾ in long, brown. oblong, containing 10-15 flat, winged seeds, ⅙ in across.

A lofty tree of fast growth indigenous in Bengal, Burmah and N. Australia frequently cultivated and run wild in Travancore. Height 100 ft. Diam 2½ ft.

Flowers Sep.-Oct. and again in Feb.-March. Fruits ripen in Dec. and June.

Bark brown, rough, fibrous, peeling off in vertical strips. Wood yellowish-pink to reddish-brown, very hard, cracks and splits and in breaking snaps suddenly, owing to its often being cross-grained. Pores very numerous, of medium size, running in irregular lines or curves. Rays very fine and uniform, crossed by pale, wavy, irregular lines of pale tissue. Annual rings not visible.

W=55 lbs. P.=828.

Gamble gives 70 lbs for green wood, 60 lbs for seasoned wood of old trees, and 50 lbs for similar wood of young trees.

The casuarina tree has been planted in avenues at Trivandrum and Quilon and in private compounds as a fast growing tree, and plantations of it have been formed by Government during the last 6 or 8 years, the total acreage being now 142 acres, but the whole of this area is not doing well. The first plantings were made at a distance of 4 ft. by 4 ft. and the latter 9 ft. by 9 ft. The former have been by far the most successful, but even in the closer planted area there are patches where the trees have not thriven at all, possibly because the soil was too stiff. Where the ground water rises to the surface, as in the monsoon, the trees die out, and when the level of the water sinks too low, as in sandy soils during the dry weather, the Casuarina does not grow into a tree, but spreads out into a low bush. In the nursery-beds ants carry off the seeds, and caterpillars and mole-crickets sever the young seedings, Plants should not be put out too small, but should be kept in the beds till they are 2 ft. high at least. Even then they require to be carefully watered during the hot weather for 2 years, and this considerably increases the cost, so that it may be said that Casuarina planting on a large scale is not so profitable in our wet climate as the encouragement of the indigenous species, but the tree may be used as a nurse for slower growing trees. As explained by Gamble the chief value of the Casurina is for reclaiming sand-dunes and in improving the coast lands by covering them with a deposit of leaf mould in which other trees will afterwards grow. The tree does not grow to a great age, 50 years being about the term of life of the oldest, but many trees reach their

* Brandis says that the tree is monœcious, male and female flowers are some times found on the same branch, but (as often happens with monœcious trees) some trees habitually bear male, others female flowers only. With us male and female flowers are invariably borne on different trees.

maturity in 25 years, and from that time they become hollow and twisted. and when cut or blown down are found to consist of mere shells filled with brown dust.

According to the " Note on Casuarina planting ,. (Ind. Forester XXII. 8) the average age of felling is 10 years : the average out turn on the East coast is 50 tons, per acre and inland 28 tons. The cost per acre varies form 32½ to 109 Rs. per acre and it is calculated that at 10 years a plantation should give 40 tons. per acre, yielding a return of 38 Rs. for every acre. The wood is used almost entirely for fuel, for which purpose it is excellent, but when a sound tree is met with the timber may be employed for beams and rafters. For ordinary work it is too hard and heavy. The bark is used in tanning and a brown dye is extracted from it. (Dict. Econ. Prod.)

ORDER LXXI. SALICACEÆ.

Deciduous trees of fast growth with simple, alternate, stipulate leaves, base 3-5 nerved. Flowers diœcious in catkins, similar in both sexes, one within each bract. Perianth none, disk more or less developed in all flowers. Male flowers .—stamens 2-12, no rudimentary ovary. Female flowers .—ovary 1-celled, ovules numerous, style 2-4 fid. Fruit a 2-valved capsule containing numerous minute seeds in a mass of silky hairs.

This.Order consists of soft-wooded trees of the genera *Salix* and *Populus* almost all of which are natives of temperate climates. Only one tree occurs in Travancore.

1. SALIX, Tournef.

Characters of the Order.

S. tetrasperma, Roxb ; Fl. Br. Ind. v. 626 ; Bedd. Fl, Syl. t. 560
302 ; Gamble Man. Tim. 685 ; Brandis Ind. Tr. 636. Tam and, Mal. *Vanji.*

Leaves 2-6 in. by 1-2 in., lanceolate, acuminate, narrowed to the base or rounded, serrulate, glabrous and shining above, glaucous beneath, nerves prominent and numerous. Petiole ½-1 in. Stipules ovate, deciduous. Male flowers, small, yellowish, fragrant, in catkins 2-4 in. long, stamens 5-12, free, with 2 glands at the base. Female flowers greenish in catkins 2-4 in. long, ovary stalked, stigmas 2, each 2-lobed. Capsule ovate, 2 valved, ¼ in. long, glabrous or puberulous, containing 4-6 seeds.

A large deciduous tree common on the banks of streams and in swampy places on Peermed, the Cardamom Hills and the High Range between 2,000 and 7,000 ft., often gregarious. Height 80 ft. Diam. 3 ft. Occurs through N. India, Burmah and the hills of S. India, but absent from Ceylon.

The leaves drop about Sep. or Oct. and appear again with the flowers in Dec.-Feb. Fruit ripens April-May.

Bark rough with deep vertical fissures, ½ in. thick, greyish-brown. " Wood red, soft, porous, even-grained. Annual rings indistinctly

marked by lines. Pores small, often subdivided, very numerous, uniformly distributed. Medullary rays fine, numerous, distinct, bent round the pores.

W = 31 lbs. (Gamble's average.)

Growth fast, from 2-7 rings per inch of radius. Has been tried elsewhere for cricket-bats and for gunpowder-charcoal, and in Assam for posts and planks. The twigs are made into baskets and the leaves lopped for cattle-fodder. The bark is said to be used for tanning and as a febrifuge. (Gamble). It does not seem to be used in Travancore for any purpose.

GYMNOSPERMS.

ORDER LXXII. CONFIERÆ.

Trees usually resinous with alternate, rigid, linear or scale-like leaves, rarely broad. Flowers without a perianth, monœcious or diœcious. Male flowers of many 1-or more-celled anthers seated on the scales of the catkin. Female flowers of one or more naked, sessile ovules, seated on a scale, and arranged in cones. Seeds often winged, endosperm fleshy and oily, cotyledons 2 or more.

An Order of very great economic importance in the temperate regions of the world, as it contains most of the timbers used in buildings, in manufactures, and the arts. Some of them attain a huge size as the *Wellingtonia gigantea* of N America, and *Dammara australis* the "Kauri pine of New Zealand: many of them yield valuable timber as the *Cedrus Deodara*, the "Deodar" of N India, while others produce resin, oil, pitch and turpentine. Only one species is found in Travancore and it is confined to a very limited area. The wood of coniferous trees is very simple in structure. It has no pores, but consists of cells called *tracheides* running longitudinally, with medullary rays crossing them at right angles and radiating from the centre. Many species have resin ducts. The annual rings are generally conspicuous.

1. PODOCARPUS, L'Herit.

Evergreen trees with opposite or alternate, liner-lanceolate or ovate-lanceolate, sometimes dimorphous, leaves. Flowers usually diœcious. Male aments axillary or terminal, solitary or fascicled, bearing numerous antheriferous scales, anthers two, 1-celled. Female flowers solitary, or 2 together and spicate, the peduncle naked or with several bracts, ovules reflexed. Fruit fleshy, globose, nut bony.

561 **P. latifolia**, Wall; Fl. Br. Ind. v. 649; Bedd. Fl. Syl. t. 257; Gamble Man. Tim. 702; Brandis Ind. Tr. 695. Tam. *Narambali*.

Leaves 3-7 in. by $\frac{3}{4}$-2 in. sub-opposite, lanceolate, tapering to both ends, thick, coriaceous glabrous and dark shining green, longitudinal nerves numerous. Petiole broad, flat, very short. Male aments $\frac{1}{3}$ in. long, bracteate, solitary or 2-3 together on a short peduncle. Female flowers on $\frac{1}{2}$ in. bracteate peduncles. Fruit ovoid, 1 in. long, seated on a fleshy receptacle.

A tall erect tree with a cylindrical stem and tin colourless juice, only found in our forests at elevations above 3000 ft. on Mutthukuli Vayal and near the boundary between Travancore and Tinnevelly South of Agusteer peak, rare. Height 60 ft. Diam. 2 ft. Occurs also in Cachar, Burmah and the Malay Peninsula, but absent from Ceylon.

Flowers in Aug.-Sep, Fruits in Jan.-Feb.

Bark smooth, mottled brown and white, ¼ in. thick. Wood grey, aromatic, moderately hard, even-grained. Annual rings faint. Rays extremely fine, very numerous. Gamble gives.

W—32 lbs.

The timber is said to be good, but it is not used in Travancore.

ORDER LXXIII. CYCADACEÆ.

Small trees resembling tree-ferns with cylindrical trunks, somtimes forked, clothed with the compacted woody bases of petiolese. Leaves in a terminal crown consisting of simple, short, subulate, prophylla, and long-petioled, pinnate, true leaves, with alternate pinnules. Flowers diœcious, without a perianth. Male collected in an erect woolly cone, consisting of a short axis, clothed with closely imbricate scales, each scale bearing beneath groups of 3-5 one-celled anthers. Female consisting of a whorl of spreading carpels (carpophylla) bearing on marginal notches one or a few naked ovules. Seed large, enclosed in a thin shell, endosperm copious.

An Order of little importance, containing only one small tree indigenous in Travancore.

1. CYCAS, Linn.

Characters of the Order.

C. circinalis, Linn; Fl. Br. Ind. v. 656; Bedd Fl. Syl. ccxxvii; Trimen Fl. Cey. iv. 121; Gamble Man Tim. 721; Brandis Ind. Tr 698. Tam. *Madana kámam*: *sanning kai* (the fruit). Mal, *Kalanga*: *kalarei* : *intha*.

Prophylla 2-3 in. long. Leaves 3-9 ft. long, with 80-100 pairs of linear acuminate, bright green, glabrous leaflets each 8-12 in. by ½ in. Petiole 18-24 in. with short spines near the base. Male cone 1-2 ft. cylindric-ovoid, scales 1½-2 in. long, tip contracted into a red brown spine 1 in. long. Carpophylls 6-12 in. by 1-1½ in. narrowed into a long stalk, clothed with buff tomentum, bearing 6-10 ovules. Seeds ovoid, orange-red, 1½ in. long, smooth.

A small tree very common in deciduous forest from sea-level to 3,500 ft. and especially abundant where teak thrives. Height 25 ft. Diam. 1 ft. Also found throughout Southern India, and in Ceylon, Java, and Africa.

Flowers in Feb-March. Fruit ripens Aug.-Oct.

The bark is pale brown tessellated in small diamond-shaped scars Wood soft, yellowish, consisting of alternate layers of woody and bast

issue. The woody layers contain no pores. Rays fine, numerous and regular, and Gamble gives.

W=37 lbs.

The wood is useless, but the seeds yield a valuable flour on which many of the hill-tribes subsist for months. For this purpose the kernels of the seeds are extracted, split in two and dried in the sun, and they are then ground into flour as need be. Sago can also be obtained from the pith of the tree, but as the quantity so obtained is only about what can be got from the seeds, the hill tribes do not often resort to this method of collection. The stems give a clear gum.

MONOCOTYLEDONS.

Order LXXIV. PALMEÆ.

Trees with leaves alternate or scattered or crowded towards the top of the trunk, plaited in bud. pinnatisect or palmatisect, rarely simple, veins, parallel. Flowers uni-or bisexual, small, in an axilary or terminal panicle or spike (spadix), enclosed in one or more woody sheathing bracts (spathes). Perianth inferior, segments 6 in two series, imbricate or valvate. Stamens 3 or 6 inserted at the base of the perianth, anthers versatile. Ovary 1-3 celled, or of 1-3 carpels: cells 1-2 ovuled . stigmas 3, usually sessile. Fruit a drupe or berry, seeds with copious endosperm, ruminate or even.

A very important economic Order, but to the forester not of much value for timber. We have 5 indigenous species, and 3 others cultivated on a large scale and, more or less, run wild. The most important species belonging to it and not found in Travancore are *Phoenix dactylifera* the "Date palm," indigenous in the Euphrates and Tigris valleys and the African Sahara, and only thriving in very dry climates, and *P. sylvestris* which yields the date-sugar of Bengal, *Eloeis guineensis* the "Oil palm" of the western coast of Africa, *Ságus lævis* and S. *Rumphii* the "Sago palm" of the eastern islands of the Indian Ocean, and *Lodoicea Sechellarum* the "Double cocoanut" or "Coco de mer" of the Seychelles islands. Palms yield food stuffs, wax, flour, gums, fibres and building timber, while the canes (*Calamus*), which include a large number of species, are very extensively used for furniture.

"The wood and bark are not distinct, but the stem generally" "consists of an inner softer and an outer harder portion. The stem" "consists of a large number of scattered fibro-vascular bundles," "embedded in soft cellular tissue, On a horizontal section the" "vascular bundles appear most numerous near the circumference of" "the stem, where they are small very hard, and often nearly" "confluent so as to form a hard rind. In the centre of the stem the" "bundles are less numerous and generally not so hard as near the" "circumference. Consequently, the central portion of the stem is" "chiefly composed of cellular tissue which often decays, so that the" "centre of old palms is frequently hollow, with a few isolated fibres". (Gamble).

"Preparatory to the production of flowers and seed, the paren-" "chyma in the trunk of *Phoenix* and other genera (analogous to "

" what we find in the Beech before a seed-year) is full of starch," "which at the time of flowering is transformed into sugar. The" "starch of many species is utilised as sago, while the sugary sap" "is obtained either from the cut spadix, or (in the case of Phoenix" "from the trunk below the crown of the leaves" (Brandis).

Leaves pinnate or pinnatisect
  Leaves simply pinnate, Leaflets linear
    Spadix springing from below the leaves
      Male flowers at the tips of the spikes, and female flowers at the base . 1. *Areca*.
      Male flowers at the tips of the spikes, and both sexes in the lower portion . 2. *Bentinckia*.
      Male and female flowers in clusters of 3 arranged all along the spike . 3. *Pinanga*.
    Spadix springing from among the leaves
      Leaflets praemorse. Stamens, numerous . 4. *Arenga*.
      Leaflets acute, Stamens 6 . 5. *Cocos*.
  Leaves pinnate or decompound, leaflets connate . 6. *Caryota*.
Leaves fan-shaped
    Spadix interfoliar. Tree polycarpic . 7. *Borassus*.
    Spadix terminal. Tree monocarpic . 8. *Corypha*.

1. ARECA. Linn.

Trees with erect annulate stems and pinnate leaves, base of petiole forming an amplexicaul sheath. Spadix infrafoliar, monœcious branches pendulous, male flowers numerous and solitary on the branches, female flowers few, at the base only. Male flowers:—petals lanceolate, valvate, longer than calyx : stamens 3-6, filaments short. Female flowers:—sepals and petals broad, imbricate : ovary 1-celled, stigmas 3, ovule erect. Fruit ovoid or oblong, seed subhemispheric, endosperm ruminate.

A. **Catechu**, Linn.; Fl. Br. Ind. vi. 405 ; Trimen Fl. Cey. iv. 567
32I ; Gamble Man. Tim. 726 : Brandis Ind. Tr. 646. Eng, *The Areca* or *Betel nut palm*. Tam, and Mal. *Kamugu* : *pákku*, *adakka*.

Leaves 4-6 ft. long with numerous crowded, glabrous leaflets, 1-2 ft. long, linear or linear-lanceolate, many-veined. lower finely acuminate, upper praemorse or bifid, sheath long, smooth. Spathes simple, spadix infrafoliar 12-18 in. long. branched and smooth, its branches filiform, terminating in pendulous male spikes. Flowers greenish yellow ; male small, stamens 6 on short filaments, pistillode 3-fid , female 1-3 together, larger than the male, staminodes 6. Fruit $1\frac{1}{2}$-2 in. long, ovoid, pointed, deep orange, pericarp fibrous. Seed depressed-conical, nearly globose $\frac{3}{4}$-1 in. diam, pale brown, rather rough.

A tall erect tree with a slender annulate stem, reaching a height of 80 ft. and a diam. of 9 in. Not indigenous in Travancore, but extensively cultivated in all the wetter parts of the country up to an elevation of 3,000 ft. or more. Cultivated through India, Ceylon and Burmah in suitable localities. Believed to be a native of the Sunda islands and Cochin-China.

Flowers from April-Oct. Fruit ripens from Oct. to Feb.

Bark smooth, greenish-grey. Wood brownish-grey. Vascular bundles large, brown, forming a hard rind on the outside of the stem

W—57 lbs.

The most useful part of the tree is the nut which is used for chewing with the leaf of the Betel vine and lime. It is aromatic and stimulant, and is a valuable nervine tonic. It is used in medicine as an astringent to stop bleeding, and it is a useful vermifuge for dogs. Catchu is prepared from the nuts by boiling.

The wood is used for rough buildings, scaffolding-poles, and furniture, but it is neither strong nor lasting. The sheaths of the leaves are employed for hats and buckets, but unless kept constantly moist they dry and split. The seeds are turned into necklaces and other small articles.

An Areca-nut tree begins to bear at from 5 to 10 years old according to soil, and continues to do so for 20 to 25 years. The yield is from 25 to 400 nuts per tree and 200 is often taken as an average. At 1,200 trees per acre the crop would amount to 3,60,000 nuts equivalent to about 30 cwts. The wholesale value at Colombo is usually Rs. 8 per cwt. but in Madras and Bombay it is as much as Rs. 15. Bombay is the centre of the trade (Dict. Econ. Prod).

In certain parts of Travancore the Arecanut-tree has for some years been attacked by a mysterious disease which causes the death of the leading shoot and checks the production of any crop. The disease seems to be worst in places where the soil is alluvial and clayey, and especially where the ground is liable to inundation.

2. BENTINCKIA, Berry.

Treees with erect, annulate stems and pinnate leaves, base amplexicaul, leaflets linear. Spadix infrafoliar, much branched, monœcious, the branches bearing at their outer ends male flowers only, while the lower portion bears groups of one or two male and one female, all sunk in spirally arranged pits, spathes numerous. Male flowers minute, petals valvate, longer than calyx, stamens 6, pistillode conical. Female flowers ovoid, rather larger than male, staminodes 6; ovary 3-celled 1-ovuled. Fruit succulent, globose, seed pendulous, endosperm uniform.

564 **B. Coddapanna,** Berry; Fl. Br. Ind. vi. 418; Gamble Man Tim. 727; Brandis Ind. Tr. 647. Eng. *The Hill Arecanut.* Tam. *Varei-kamugu.* Mal. *Kanthal: kanthakamugu.*

Leaves 3-5 ft. long, consisting of 30-40 pair of opposite linear leaflets, each 2-2½ ft. by 1-1½ in. sessile, entire, green on both sides midrib well marked. Petiole broad, sheathing. Spadix much branched, succulent, reddish-purple, 2 ft. long by 3 ft. broad, the branches often exceeding 1 ft. long and ¼ in. thick, male flowers ⅛ in. across, bright pink, all opening first, female flowers ⅙ in. across, opening after the male have fallen. Fruit ½ in. diam. globose, smooth, shining, sessile, bright chocolate.

An erect tree common on the hills of S. Travancore, generally found on precipitous rocky slopes between 2,500 and 6,000 ft. Height 60 ft. Diam. 1 ft. Endemic.

Flowers April-May. Fruits Nov.-Dec.

Stem smooth. grey. Wood grey with large fibro-vascular bundles the horny part grey, each with a pore on the inner side.

The wood is not used, the terminal bud is edible, and may be eaten either raw or cooked. It has a nutty flavour.

3. PINANGA, Blume.

Small trees with annulate stems and pinnate leaves. Spadix infrafoliar, monoecious, spathe solitary, flowers 3 together in clusters of one female between two male all along the spikes. Male flowers. sepals acute, keeled, petals ovate or lanceolate. valvate, stamens 6 or more. Female flowers smaller, sepals and petals orbicular, imbricate, ovary 1-celled, stigmas 3, ovule erect. Fruit cylindrical or ovoid, pericarp fibrous, endosperm ruminate.

P. Dicksonii. Blume, Fl. Br. Ind. vi. 409. Gamble. Man. 565
Tim. 727. Brandis Ind. Tr. 647. *Kána-kamugu.*

Leaves 3-5 ft. long consisting of about 20 pairs of linear, praemorse, sessile leaflets, each 1-2 ft. by 1 in. with 2 strong ribs running the length of the leaflet. Petiole broad sheathing. Spathe simple. Spadix consisting of about 4-6 stout spikes. Male flowers small stamens 20-30, pistillode 0. Female flowers, staminodes 6. Fruit green, smooth, cylindrical, pointed, $\frac{2}{3}$ in. by $\frac{1}{3}$ in.

A small tree common in moist hollows in the evergreen forests of Travancore between 1000-3000 ft. often gregarious. Height 18-25 ft. Diam 2-3 in. Found also on the Western Ghauts and Neilgherries.

Flowers and fruits April—May.

Stem dark green, smooth. Wood pale reddish-brown. soft and useless. The nut is eaten by the hillmen as a substitute for the betel nut.

4. ARENGA, Labill.

Stout palms, upper portion of the trunk densely clothed with the black, fibrous remains of the leaf-sheaths. Leaves pinnatisect, leaflets linear praemorse, auricled at base. Spadix large, much branched, peduncle clothed with numerous imbricating spathes. branches pendulous, monoecious, male and female flowers usually solitary and in separate spadices. Male flowers :—sepals 3, orbicular; petals oblong, stamens very numerous, pistillode 0. Female flowers subglobose, petals valvate, stamens many or 0, ovary subglobose, 3-celled. Fruit globose 2-3 seeded, endosperm equable.

A. Wightii, Griff. Fl. Br. Ind. vi. 422. Gamble Man. Tim. 566
728. Brandis Ind. Tr. 648. Eng. *The wild Coconut.* Tam. *Alam panai.* Mal. *Aláthil thénga.*

Leaves 15-25 ft. long, pinnatisect, leaflets alternate, linear, 40-50 pair, each leaflet 2-3 ft. by $1\frac{1}{2}$ in., glabrous and dark green above, white beneath, quite entire or sparingly toothed towards the apex

base unequal, lower auricle very large and over lapping the rachis. Petiole 4-8 ft., base sheathing. Male and female flowers on separate spadices 3-4 ft. long, male straw-coloured, ¾ in. long, in pairs, sessile, female solitary. Fruit depressed globose, smooth, pale green, 1 in. long and 1⅓ in. diam. containing 2-3 seeds.

An erect palm with a short, stout trunk, up to 25 ft. high and 1 ft. diam. not uncommon in the evergreen forests of S. Travancore, often gregarious and generally found in moist stony ravines between 500 and 2000 ft. Found also in N. Kanara and the Neilgherries, but not in Ceylon.

Flowers in April and September. Fruits May-June and Nov.-Dec.

Stem smooth, grey. Wood very fibrous, blackish-grey. inner part soft and perishable.

The only use to which this palm is put in Travancore is to supply toddy to the hillmen. This is obtained in the usual way by cutting the flowerstalks and collecting the sugary sap which drips from them. The horsehairslike fibre found at the base of the petiole is valuable for cordage, but, so far as I know, it is seldom used. The pith of a similar species (*A. saccharifera*) is capable of producing large quantities of sago, and our tree may probably be equally useful. The tree dies after ripening its fruit.

5. COCOS, Linn.

Lofty trees with erect annulate stems, and pinnatisect leaves forming a terminal crown, petioles sheathing with a fibrous base. Flowers monoecious inflorescence of numerous simple spikes springing from a short peduncle and forming the spadix. Male flowers crowded at the ends of the spikes, and generally mixed with female flowers lower down, female only at the base. Male flowers: sepals 3, small, valvate, petals 3, valvate, stamens 6, pistillode minute or O. Female flowers much larger, sepals and petal 3 each, orbicular, staminodes forming a fleshy disk, ovary 3-celled. Fruit large, ovoid, trigonous, 1-seeded, pericarp thick, fibrous.

567 **C. nucifera,** Linn. Fl. Br. Ind. vi. 482. Trimen Fl. Cey. iv. 337; Gamble Man. Tim. 739. Brandis Ind. Tr. 648. Eng. *The Cocoanut palm.* Tam. and Mal. *Thenga.*

Leaves 10-15 ft. long, pinnatisect, leaflets 2-3 ft. by 2 in., linear-lanceolate, acuminate, bright green, smooth and shining. Petiole 3-5 ft., stout. Spathe 1½-2 ft., narrowly oblong, tapering at both ends, springing from within the leaves, spadix about 1½ ft. when in flower, extending to 3 or 4 ft. when in fruit. Flowers straw-coloured, male ¾ in. long, female 1 in. Fruit yellowish-green, 6-10 in. long, trigonously ovoid, smooth, containing a hard ovoid nut 4-5 in. diam.

A very lofty palm, seldom growing straight, cultivated in groves and gardens all along the coast and almost run wild. Not indigenous in Travancore. Does not thrive far inland, at all events not above 1000 ft. elevation. Height 80 ft. Diam 1½ ft. Cultivated throughout India and Ceylon but not indigenous. Its original home is supposed by some to have been the Western Coast of America near the Isthmus of Panama, and by others the islands of the Malay Archipelago, from either of which localities the fruits must have been carried by ocean currents to distant shores. The cocoanut palm has been cultivated in India from a remote antiquity.

Flowers and fruits throughout the year but chiefly in the dry weather. The fruits take about 10 months to come to maturity.

Stem smooth, annulate, greyish-black. Wood hard, red outside, reddish-brown but softer inside. On a vertical section the wood is prettily streaked.

W=55 lbs. P=585 (Gamble's average).

The wood is known as "Porcupine wood". It is used for house-building, especially for rafters, and when kept dry it will last a long time. "It makes very pretty and durable furniture" (Gamble). Its leaves are plaited into the cadjans so extensively used in this country for thatching of all kinds. Toddy is obtained by cutting the flower-stalk and allowing the sap to drip into small pots tied below them which are emptied night and morning. The fluid in the young nuts is a very refreshing drink: the kernels of the nuts are daily consumed in curries by all classes, and an oil is expressed from them which is used locally both for lighting and for anointing the body. A large trade is done in Travancore in the oil, the cocoanut oil of Cochin, which is chiefly the produce of Travancore trees, being the best in the market. The dried kernels known as "copra" are exported in quantity to Europe for the manufacture of condiments, oil, candles and soap.

The fibrous rind of the nut known as "coir" is worked up into ropes and matting which are shipped for sale to all parts of the world. Lastly, the shell of the nut is made into cups and spoons, while all broken pieces and inferior shells are used for burning as they are highly inflammable. In a word, there is scarcely any part of the cocoanut tree which is not useful and it is by far the most important tree or plant grown in Travancore. The value of the produce of this tree exported last year amounted to Rs, 91,67,203 or 32 per cent of value of the whole exports of the State.

Cocoanut palms are usually planted at a distance of 20 to 25 ft. each way which gives from 60-80 to the acre. They begin to bear in from 5 to 8 years, according to circumstances, and continue to do so for 70-80 years. The yield is from 30 to 120 nuts per tree per year, and 50 may be taken as an average. This would give from 3000 to 4000 nuts per acre each year which at present prices would sell at Rs. 40 per thousand in addition to the value of the coir. (Dict. Econ. Prod.)

The cocoanut palm is attacked by several species of insects, the most formidable of which is the "Rhinoceros beetle" *Oryctes rhinoceros* which tunnels large holes through the leading shoots and stops their growth. The only remedy is to extract the beetle with the aid of a wire. A very serious disease has appeared in Central and N. Travancore during the last 20 years. It is of fungoid origin and spreads under ground, but it first makes itself visible by the discoloration of the leaves, the death of the leading shoot, and the dropping of the flowers and fruit. The disease appears to be identical with that which attacks the Areca-palm already mentioned, and it is worse in clayey soils and those in which the drainage is poor. No remedy has yet been discovered for it.

6. CARYOTA, Linn.

Tall palms with annulate stems and few, broad, bipinnatisect leaves, leaflets cuneate, præmorse or rounded. Spadix monœcious, axillary, much branched, branches pendulous, spathes 3-5. Flowers numerous solitary and male, or in groups of three, two males with one female interposed. Male flowers: sepals rounded, imbricate, petals oblong, valvate, stamens numerous, pistillode none. Female flowers subglobose, sepals orbicular, imbricate, petals short, staminodes 3 or 6; ovary trigonous, 3-celled: stigma 3-lobed: ovule erect. Fruit globose, 1-3 seeded; seed erect, endosperm ruminate.

568 **C. urens**, Linn; Fl. Br. Ind. vi. 422; Trimen Fl. Cey. iv. 324; Gamble Man. Tim. 729; Brandis Ind. Tr. 654. Eng. *The Bastard Sago* or *Kitul palm.* Tam. *Thippili-panei*, Mal. *Chunda-paná, kala-pana.*

Leaves 18-20 ft. by 10-12 ft., bipinnatisect, leaflets 4.8 in., fascicled or alternate, sessile, cuneiform, truncate irregularly serrate-toothed on the truncate margin, outer margin produced into a narrow triangular point, quite glabrous, bright green and shining. Petiole very stout, sheating, sheath smooth with fibrous, netted margins. Spadix 10-12 ft. long, with simple branches, drooping from the short, stout peduncle. Male flowers ½ in. long, female larger. Fruit globose, ¾ in. diam, red or yellow, with a thin acrid pulp, causing a burning sensation when tasted.

A lofty tree 40-50 ft. high and 1½ ft. diam. thinly scattered through all our evergreen forests from 0-3000 ft., common but nowhere abundant. Very much cultivated for the toddy obtained from the flower-stalk. Occurs in Assam, Bengal, Burma the Western Ghauts and Ceylon.

Flowers and fruits throughout the year.

The stem is smooth, grey, annulate and cylindrical. Wood very hard in the outside portion which is about 2-3 in. thick. brown with close black streaks. The core or centre of the stem is reddish-white, soft and pithy.

The outer wood is strong and durable and it is used in Travancore for fencing, agricultural implements and house-building, also for water conduits. The fibre from the sheating petioles is made into fishing lines, whence the Malayalam name of the tree. The leaves yield the "Kitul" fibre which is employed in Ceylon for making brushes, brooms and other articles: it is not so used here. A flour is made from the inner part of the stem, which contains a starchy pith mixed with the fibres, by washing it in water and straining it. A tree will yield more than 20 lbs. of flour, but those trees which have given much toddy will not produce so large a quantity as those which have been lightly tapped.

The growth is very rapid. When the tree is from 10-15 years old it begins to flower, throwing out a spathe from the top of the tree. and when this has fully developed others appear at the next lower

axils at the rate of 5 or 6 a year working downwards. This continues for 4 or 5 years, during which time spathes are thrown out from all the leaf-axils. The tree then gradually dies. Toddy is obtained by c tting the end of the spathe and working the undeveloped flowers with the hand till the juice begins to drip. This is collected in pots tied at the end of the spathes and emptied morning and evening. A tree is said to yield 4-20 quarts a day (Indian Forester xxi. 1934). From the juice a course sugar is prepared by boiling. The leaves and stems are the favourite food of elephants. (Dict. Econ. Prod,)

7. BORASSUS, Linn.

A tall diœcious palm, with a large terminal crown of fan-shaped leaves. Spadix interfoliar, very large, simply branched, lower part covered with numerous sheathing fibrous bracts. Male inflorescence of thick cylindric spikes in twos or threes at the end of the branches of spadix. Female spikes few-flowered, paniculate, with numerous annular sheathing bracts. Male flowers in scorpioid spikelets, sepals and petals 3 each, imbricate, stamens 6, pistillode of 3 bristles. Female flowers large, globose. perianath accrescent in fruit, staminodes 6.9, ovary globose 3-4 celled, ovules basilar, erect. Fruit sub-globose with 1-3compressed pyrenes, seeds compressed, quadrate, endosperm equal.

B. flabellifer, Pinn, Fl. Br Ind. vi. 482, Trimen Fl. Cey iv. 336; Gamble Man. Tim. 737. Brandis Ind, Tr. 657. Eng. *The Palmyra palm*. Tam. and Mal. *Karrumpana*. 569

Leaves 18 30 in. long by 3-5 ft. across, consisting of 60-80 parchment like segments, smooth, shining, linear-lanceolate, and connate to half their length. Petiole 2-4 ft. Male spikes drooping, flowers pink and yellow, opening one at a time, female flowers 1 in. diam. Drupe obovid, 8 in diam., smooth. dark brown and yellow, pyreues broad, black, $2\frac{1}{2}$ in. long, immersed in yellow pulp. A lofty tree 70-80 ft. high and $1\frac{1}{2}$-2 ft. diam. A native of Africa and introduced here many centuries ago, now run wild, confined almost entirely to the drier parts of the country, but planted occasionally elsewhere for its leaves. Cultivated through India, Burmah and Ceylon.

Flowers in March-April. Fruit ripens May-June.

Stem greyish-black, cylindrical, but often swollen near the tree. Outside wood black, hard, inside soft and light brown, handsomely streaked on a vertical section. Gamble gives the weight and strength of the outer hard wood as

$$W = 65 \text{ lbs.} \quad P = 879.$$

The inner wood is considerably lighter, and the average weight of the outer and inner wood together is about 50 lbs.

The outer wood is extensively used in S. Travancore for rafters' posts and fences, and the hollowed out stemps for water-pipes. The leaves are used for thatching houses, for fans, hats and basket-work, and until modern times, the folded sections of the leaves (known as cadjans) were employed (throughout the country for letters, documents, and records of all sorts, the writing being scratched on the

surface with a stylus. Dried in the sun and smoked they lasted for centuries. The pulp of the fruit is edible but the chief product of the tree is the sweet sap which runs from the "peduncles cut before flowering and is collected in bamboo-tubes or earthern pots tied to the cut peduncle" (Brandis). The sap may be drunk fresh, or fermented into toddy, and it is distilled to produce arrack or converted into "jaggery" or coarse sugar, which is the chief sugar made in Burmah and S. India. Gamble states that the female tree gives about one and a half times as much sap as the male tree. This extraction of the sap does not seem to injure the wood. Lastly, the fibres from the petioles of the leaves and midribs are used in brush-making. A very considerable trade in this product has sprung up in Travancore during the last dozen years. For a fuller account of its uses the Dict of Economic Products may be consulted.

8. CORYPHA, Linn.

Lofty trees dying after once flowering and fruiting (monocarpic) Leaves terminal, very large, palmately multifid, segments folded lengthwise. Spadix very large, terminal, erect, spathes many, tabu. lar. Flowers bisexal. calyx cupular, 3-fid, petals 3, connate below, stamens 6, ovary deeply 3-celled, ovules erect. Fruit of 1-3 fleshy drupes, seeds globose, endosperm horny.

570 **C umbraculifera,** Linn. Fl. Br. Ind. vi. 428; Trimen Fl Cey. iv. 328; Gamble Man. Tim. 732; Brandis Ind. Tr. 657. Eng. *The Talipot palm*. Mal. *Kodapana*.

Leaves 5-16 ft. broad by as many long, cleft to about the middle into 80-100 linear-lanceolate lobes, acute or bifid. Petiole 5-10 ft. very stout, spinous at the edges. Spadix pyramidal, 10-20 ft. high with pendulous branches. Flowers cream-coloured, small, drupe. globose, $1\frac{1}{2}$ in. diam., greyish-olive, rather rough.

A magnificent tree especially when in flower the spadix standing out high above surrounding trees and making it very conspicuous. It is a moot question whether this tree is indigenous in Travancore or not, I have never seen it or heard of its being wild in any of our forests execept in the two adjacent valleys of the Ambanad and Shaliakara rivers. I am therefore inclined to think that the tree was introduced there, though this must have taken place a very long time ago, as the trees seen there are of all ages. It is very much cultivated in N. Travancore in places where grass is not procurable, in order that it may supply thatching material. The tree attains a height of 60-80 ft. and a diameter of 2-3 ft. and dies at about 40 years of age. Occurs wild in Malabar and Ceylon and is cultivated in Bengal and Burmah.

Flowers Nov..Jan. Fruits Feb.-May.

Gamble describes the wood as soft, with a hard rind composed of black vascular bundles: those in the centre of the stem are soft and pale, those of the outside very hard and black, and he gives

W = 42 lbs.

The chief use of this trees is to supply thatching material for houses and huts: the leaves are also used for making fans, mats, and umbrellas, and before the introduction of the Palmyra palm long strips of them were used for writing on. Flour is obtained from the interior of the stem in the same way as it is made from *Caryota urens*. Trimen states that the young fruit pounded is used for stupefying fish, and that the horny seeds are known as "Bazarbatu nuts." They are used as beads in Ceylon and in the manufacture of buttons in Europe. They are sold at 20-25 Rs. per candy of 616 lbs. (Dict. Econ. Prod.)

ORDER LXXV. PANDANACEÆ.

Trees or shrubs with linear or lanceolate, sessile leaves, base heathing, edges and midrib usually spinous. Spadix axillary or serminal clothed with leafy spathes. Flowers small diœcious, perianath none: stamens numerous, filaments free or connate: ovary of 1 or more carpels. Fruit either drupaceous or a many-seeded berry, obconical, numerous, massed together to form a syncarpium; endosperm oily, abundant.

1. PANDANUS, Linn.

Characters of the Order

P. tectorius, Solander; Fl. Br. Ind. vi. 485 (under *P. fascicularis*); Bedd. Fl. Syl. ccxxviii; Trimen Fl. Cey. vi. 339 (under *P. odoratissimus*) Gamble Man. Tim. 740; Brandis Ind. Tr. 659 Tam. & Mal. *Kaitha*. 571

Leaves 3-5 ft. long by 2-3 in., glaucous-green coriaceous, caudate-acuminate, with strong spines on the edges and midrib. Male spadix with numerous sessile, cylindrical spikes 2-3 in. long, enclosed by long white spathes, staminal column ½ in. Syncarpium solitary, ovoid, 6-8 in. long, orange-scarlet, consisting of 50-60 drupes each containing 5-12 carpels.

A large shrub or small tree growing in clumps along the canals and backwaters of the low country, usually from 10-25 ft. high and 5 in. diam. Found through India, Ceylon and Burmah,

Flowers throughout the year.

Bark pale brown, smooth. Wood light brown, moderately hard outside, very soft inside.

The wood is useless, but the leaves are very extensively used in Travancore in the manufacture of mats and small baskets. Elsewhere it is employed for making nets, sacks and brushes. The white bracts are very fragrant and are much appreciated by the natives. An oil called "Keoro oil" is distilled from them and from the roots which is used for rheumatism and other ailments. The floral leaves are eaten raw or cooked, and the pulp of the fruit is eaten in times of scarcity. (Dict. Econ. Prod.)

ORDER LXXVI. GRAMINEÆ.

TRIBE. BAMBUSEÆ.

Shrubs or trees with alternate distichous leaves consisting of a tubular sheath split to the base and a narrow linear blade joined to the sheath by a short petiole. At the base of each leaf-blade and within it and below the petiole is the ligule. Culms cylindrical. more or less hollow and separated by partitions (nodes), the portion between two nodes being known as the "internode". Flowers mostly bisexual in distichous spikelets. usually arranged in large panicles. The spiketet consists of a number of distichous bracts (glumes), the lower and sometimes the upper being empty. Each flowering glume bears in its axil the "palea" a membranous usually 2-keeled bract, which encloses the flower consisting of 2 or 3 small scales (lodicules) 3, 6, or many stamens. and a super or one-celled ovary with 2 or 3 plumose stigmas. Fruit a one seeded caryopsis with a very thin pericarp.

As pointed out by Gamble "The distribution of bamboos de-" " pends on climate. They are found, more or less, in all tropical " " and semi-tropical regions. but especially in Asia and South " " America. In Europe there are none. and in Australia and Africa " " only a few. There is scarcely any tribe of plants in the Indian " " forests of such great importance in forest economy as the Bam-" " boos. whether from the point of view of sylviculture or that of " " utilization."

The rootstock of bamboos consists of a woody rhizome from which springs either a large number of closely packed culms, or single culms starting at intervals of several feet from the underground branches of the rhizome. The upward growth of a culm when it has once started is very rapid. Gamble mentions that " a culm of *Dendrocalamus giganteus* grew 25 ft. 9 in. in 31 days," " and one of *Bambusa Balcooa* 12 ft. in 23 days; while shoots of " " *Bambusa Tulda* according to Roxburgh. rise to their full size of " " from 20 to 70 ft. in height in about 30 days."

As regards their habit of flowering bamboos may be divided into three great classes. (*a*) Those which flower annually or nearly so, the flower-panicle terminating leaf-bearing culms. These plants do not die after flowering;; *e. g. Arundinaria Wightiana* and *Ochlandra Rheedii*. (*b*) Those which flower gregariously and periodically, all culms of one clump and all clumps in one district flowering simultaneously. The culms die after ripening their seed and usually the underground rhizome also dies; *e. g. Bambusa arundinacea* and *Ochlandra travancorica*. (*c*) Those which flower irregularly, one or a few culms in one clump or a few clumps in one locality flower together, while at other times there is a simultaneous flowering all over the district *e. g. Dendrocalamus strictus*.

After a general flowering, as described above, the seeds germinate in immense numbers, and in course of time the more vigorous plants develop into clumps, but there is a considerable difference of opinion as to how long it requires for a seedling to form a clump of full-sized stems. Brandis considers that, in the case of our

common *Bambusa arundinacea*, not less than 8.12 years are required while others hold that it will take much longer. The first year the culms are small (¼ in. diam.) and few, the next year the new culms are larger and there are more of them. and in each succeeding year they are larger and more numerous than in the year before, until in time the full size is reached, the smaller culms having in the meantime been crowded out. The culm itself never grows any thicker (see Ind. For. XVII 186).

As many of our bamboos flower at long intervals, it is far from easy to identify them, for the leaves of all bamboos are very similar in general appearance but Gamble has pointed out that the culm sheaths offer good marks for identification, while Brandis lays stress on the number of longitudinal nerves in ¼ inch in breadth of the leaf, but these marks are only of assistance in identifying species already known. To classify and describe new species the flowers and fruit are required.

"The Propagation of bamboos is simple enough: it is best done" "by seed, but can be done by taking root-offsets, though in this" "case there is always a danger of the resulting clumps flowering" "when the parent-clump flowers, also by layers from branches bent" "to the ground and pegged down, and lastly by cuttings, though" "these latter are by no means easy to get to strike". (Gamble). If offsets are put down, each of them must have a portion of a full grown culm with its roots attached to it, for the young shoot has no roots of its own and draws its sustenance from the nearest culms. The culms too must be of large size if it is desired to have a clump of large culms in a short time.

"The management of bamboo forest is easy, if the clumps have" "been attended to from the beginning, that is, if dry culms have" "been regularly removed, if cutting at or near ground-level has" "alone been permitted, and if mature culms have been regularly" "thinned out yearly, so as to leave ample space for the development" "of new ones." (Gamble). (See Ind. For XIII 577 and XVII 186).

In his work on the Indian bamboos Gamble enumerates 115 different species, but he says at the same time that many others exist in Upper Assam, Upper Burmah, Tennaserim, the Malay States, and even in South India, which are known only by a few leaves or by report, and that they will have to be described later on as the material for the purpose comes to hand. In Travancore we have 11 species the most widely known being *Bambusa arundinacea* and *Ochlandra travancorica*.

Stamens usually 3 palea 2-keeled. Fruit small, pericarp thin ... 1. *Arundinaria*.

Stamens 6, palea 2-keeled. Fruit small, pericarp thin
- Filaments free. Lodicules 3 ... 2. *Bambusa*.
- Filaments connate. Lodicules none ... 3. *Oxytenanthera*.

Stamens 6, palea 2-keeled. Fruit small pericarp fleshy or crustaceous.
- Spikelets in large globose heads. Lodicules none. 4. *Dendrocalamus*.
- Spikelets in long narrow spikes. Lodicules 3 ... 5. *Teinostachyum*.

Stamens 6 or many, palea none or similar to the flowering glume. Fruit large, pericarp fleshy or crustaceous ... 6. *Ochlandra*

1. ARUNDINARIA. Michaux.

Erect or climbing bamboos with small leaves, culms slender, 1in. diam. or less. Culm-sheaths papery, blade narrow, subulate. Inflorescence variable, paniculate or racemose, in separate culms or leafing branches. Spikelets 1 to many-flowered, usually all bisexual; empty glumes 2; flowering glume longer palea shorter. 2-keeled. Lodicules 3. Stamens usually 3. Caryopsis ovoid or narrowly oblong, dorsally furrowed, small.

Spikelets many in large terminal panicles, 3-5 flowered ... 1. *A. Wightiana*
Spikelets racemose, 1-flowered ... 2. *A. densifolia.*

572 1. **A. Wightiana.** Nees. Fl. Br. Ind. vii. 377. Bed. Fl. Syl. ccxxx. Trimen Fl. Cey. v. 309. Gamble Man. Tim. 744. Brandis Ind. Tr. 664.

Leaves 5-7 in. by $\frac{3}{4}$-1 in., base rounded, tip long-acuminate, glabrous above, glaucescent beneath, leaves of flowering branches smaller. Petiole very short. Inflorescence in dense, terminal panicles. Spikelets 3-5 flowered purple. Fruit elliptic, $\frac{1}{10}$-$\frac{1}{5}$ in.

An erect gregarious shrub with slender culm 6-10 ft. high, under 1 in. diam., internodes about 1 ft. Common in evergreen forests at 6000 ft. and over. Found also on the Neilgherries and hills of S. India and Ceylon.

Flowers annually.

The culms are not used in Travancore, but in other parts they are worked into mats, baskets and fences.

573 2. **A. densifolia,** Munro; Fl. Br. Ind. vii. 379; Trimen Fl. Cey. v. 310; Gamble Man. Tim. 744; Brandis Ind. Tr. 664.

Leaves 1-1$\frac{1}{2}$ in. by $\frac{1}{6}$-$\frac{1}{3}$ in., rounded or cordate at base, sharply acuminate, thick, lanceolate, subsessile. Inflorescence a dense panicle bearing racemes with 5 or 6 spikelets, each $\frac{1}{2}$ in, long 1-flowered. Fruit not seen.

A densely gregarious shrub up to 3 ft. high, culms $\frac{1}{3}$ in. diam. internodes 2-3 in. Found on the slopes of Aneimudi at 8500 ft Occurs also in Ceylon at high elevations. A rare species.

No use is made of it.

2. BAMBUSA, Schreb.

Arborescent or shrubby bamboos, rarely climbing, sometimes thorny. Culms mostly large, usually caespitose. Culm-sheaths broad, blade narrow, triangular. Infloresc**e**nse usually a large leafless panicle. Spikelets with 1 or many fertile flowers supported by 1-3 empty glumes. Lodicules 3. Stamens 6, Caryopsis oblong, furrowed on one side.

574 **B. arundiinacea,** Willd.; Fl. Br. Ind. vii. 395; Bedd. Fl. Syl. t. 321; Trimen Fl. Cey. v. 313. Gamble Man. Tim. 748, Brandis Ind. Tr. 671. Eng. *The Bamboo.* Tam. *Mungil.* Mal. *Mulla: illi.*

Leaves up to 8 in. by 1 in., linear-lanceolate, rounded at the base, acuminate, ending in a sharp point, glabrous above with scabrous margins. Petiole very short. Inflorescence an enormous

panicle, often occupying the whole culm. Spikelets ½-1 in. long, containing 3-7 fertile flowers, the lower ones hermaphrodite, the upper male only. Fruit ¼-⅓ in, long ending in a short beak.

This, the commonest bamboo in Travancore, attains a height of 80-100 ft. and a diameter of 6 to " in. but generally 4-5 in. internodes up to 18 in. long and walls thick. It is easily known by its thorns and its large yellow culm-sheaths. The culms are green turning to straw-colour when dry. Indigenous through India (except in the North) Burmah and Ceylon, ascending the hills to 3000 ft. and abundant in the plains. Often cultivated.

Flowers at long intervals and then dies down completely. reproducing itself from seed. The growth at first is slow and it takes 5 years for the shoots to attain 6. to 10 ft. At 7 years they have grown to 15 ft, and at 12 years old they are large enough to be used for floating timber. Culms in the Konni valley measured at 17 years from seed were 30 ft. high and 15 in. in girth. The full size is probably attained in 20 years. As a rule all the clumps in one district flower at the same time, but the flowering extends over 2 or 3 seasons. According to Beddome this species flowered in 1804. 1836 and 1868 on the Western coast, In Travancore the following dates have been noted together with the exact localities in which th flowering was observed. Lieut. Ward in his diary of 24th January 1817 speaking of the forest near Ponmana wrote "the bamboo fores is" very thick in the hollows is at the present day perfeclty blighted and" "falling to decay in consequence of their having shed flowers. In the early part of 1883 I passed through the Kulathupuzha valley and found all the bamboos there dead and blackened by fire so that the flowering must have occurred about 1880. When exploring forests of the Periyar valley on the Peermerd plateau in 1887, the bamboos there were in the same condition, and the next year when I was posted to the Malayattur Division bamboos were not obtainable for floating. Similarly, in the valleys of the Achankoil and Ambanad rivers suitable bamboos were not to be had for some years after 1890, so that it is probable that all the bamboos in the country from the Kulathupuzha valley to the North of Travancore flowered at the same time, about 1880. In the extreme South of Travancore the bamboos died down about 1868 but so far as I know, they have not again flowered, though in many places they have for a long time reached their largest dimensions.

Gamble gives the weight of the wood as 45-50 lbs, per c. ft.

The bamboo is used for a great variety of purposes all of which it is not necessary to enumerate here. Its chief uses are to float heavy timber, to supply posts and rafters for temporary buildings and scaffolding poles for permanent buildings. It is very largely used for the manufacture of mats and tatties, two or three bamboos split down one side and flattened out make very comfortable beds, and for other household purposes it is in daily use. The young thorny branches are much used for fencing, while the seed, when the bamboo has flowered, is a valuable food-grain. A floury substance called "Tabasheer" is often found as a deposit in the joints of this species. It is used medicinally (Ind. For. xiii. 107 and Dict. Econ. Prod)

Of the same genus is *B. vulgaris* the "Golden Bamboo". Tam. *Ponmungil.* Its original home is uncertain, but it is cultivated and has run wild over the warmer parts of India, Burmah, Malaya and Ceylon. The culms are bright green yellow or striped green and yellow, and it grows to a height of 50 or 60 ft. and a diameter of 4 in. It has no thorns.

3. OXYTENANTHERA, Munro.

Arborescent or scandent bamboos, unarmed and often gregarious, with small leaves. Culm-sheaths usually narrow with a narrow blade. Inflorescence a large panicle with spicate heads. Spikelets narrow, bearing 1, 2 or 3 flowers, the uppermost usually fertile, empty glumes 1-3. Lodicules none. Stamens 6, monadelphous. Caryopsis elongate, terminated by a beak.

Spikelets 1-flowered.
- Style hairy . culm smooth . 1. *O. Thwaitesii.*
- Style glabraus . culms velvety . 2. *O. monostigma.*

Spikelets 3-flowered . . 3. *O. Bourdilloni.*

1. **O. Thwaitesii**, Munro; Fl. Br. Ind vii, 402; Bedd, Fl. Syl. t 322; Trimen Fl. Cey. v. 316; Gamble Man. Tim. 750; Brandis Ind. Tr. 674. 575

Leaves 8-12 in. by 1-1½ in., lanceolate-acuminate, usually rounded at the base, ending in a sharp, twisted point glabrous above with scattered hairs beneath, margins scabrous. Petiole very short. Inflorescence a leafy panicle with short branchlets bearing heads of closely packed spiklets, each ⅓ in. long and usually 1-flowered. Fruit ¼ in. long, elliptic-oblong, glabrous except near the apex.

A very common dense reed found at the higher elevation above 3500 ft. in the evergreen forests, culms 10-12 ft. high and 1 in. diam, smooth; internodes 13-18 in. Found also on the hills of S. India and Ceylon.

Gamble says that it is very frequently in flower and that he is not sure that it dies down after flowering.

No use is made of this reed but the culms might be employed for fences or basket-making.

2. **O. monostigma**, Bedd; Fl. Br. Ind. vii. 402; Bedd. Fl. Syl. ccxxxiii; Gamble Man. Tim. 750; Brandis Ind. Tr 674. 576

Leaves 6-8 in. by 1½ in., linear-lanceolate, acuminate, ending in diam a twisted point, base rounded, glabrous above, sparsely hairy beneath. Petiole flat, ¼ in. Inflorescence a large terminal panicle of spicate branchlets bearing globular heads of spikelets 1½-2½ in. diam. Spikelets 1 in. long, one flowered. Fruit 1 in. long, linear-oblong ending in a conical point.

A dence reed found on the Anamallays by Beddome, but not seen by me. Culms 15 ft, or more high and 1 in. diam, covered with pale yellow velvety tomentum, internodes long. Occurs on the Western Ghauts from Mahableshwar to the Anamallays,

Gamble says that it is used for basket-work and other purposes, but that it is not really very good. It does not seem to be used in Travancore.

3. O. **Bourdilloni**, Gamble; Fl. Br. Ind. vii. 403; Gamble Man. Tim. 750; Brandis Ind. Tr. 675. Tam. *Kámbu.* Mal. *Arambu.* 577

Leaves 6 to 9 in. by 1-1½ in., linear-lanceolate, acuminate, ending in a scabrous point, base unequally attenuate, smooth above except near the midrib, smooth below, margins scabrous. Petiole short. Inflorescence a large panicle of spicate branchlets bearing globular heads of spikelets about 2 in. in diam. Spikelets ¾ in. long, three-flowered. Fruit linear-oblong nearly ½ in, ending in a hairy point.

A rare straggling bamboo forming open clumps, found on precipitous rocks at elevations of 3000-5000 ft. I have only seen it near Pannimad kuttha on the Travancore-Cochin boundary, on the hills above Mla-parei on the Cardamom hills, and near Peermerd. Culms 20-30 ft high and 2-3 in. in diam with thin walls, and long internodes up to 3 ft. Sheaths leathery, provided with curious calluses. I obtained it in flower near Mla-parei in 1889. It died down after flowering, and the culms are hardly full grown yet. Endemic.

The internodes of this bamboo are used to carry maps in. I have not heard of its being employed for any other purposes.

4. DENDROCALAMUS, Nees.

Arborescent bamboos, unarmed and forming dense clumps. Culmsheaths deciduous, variously auricled, blade triangular. Inflorescence a large compound panicle with long spikes carrying globular heads of spikelets. Flowers few in a spikelet, empty glumes 2 or 3. Lodicules none. Stamens 6, filaments free. Caryopsis small.

D. **strictus**. Nees; Fl. Br. Ind. vii. 404; Bedd. Fl. Syl. t. 325, Gamble Man. Tim. 750; Brandis Ind. Tr. 675. Eng *The Male Bamboo.* Tam. and Mal. *Kal-mungil.* 578

Leaves 2-10 in. by ¼-1¼ in., linear-lanceolate, sharply acuminate, point twisted, base rounded, rough and often hairy above, softly hairy beneath, scabrous on the edges. Petiole very short. Heads of spikelets 1½ in., diam. spikelets spinescent, usually hairy, very numerous: fertile flowers ⅓ in. long, 2 or 3 fertile mixed with many sterile. Fruit brown, shining, ⅓ in. long, ovoid, terminating in a beak.

A densely-tufted bamboo with solid or nearly solid culms growing to a height of 20 to 50 ft. and a diameter of 2 to 3 in., turning from dull green to yellow as they mature: internodes from 12 to 18 in: culm-sheaths from 4-10 in. covered with golden brown stiff hairs on the back. This bamboo is only found in Travancore in the Anjinaud valley, the rest of the State being too moist for its successful growth. It is confined to the drier parts of India and Burmah ascending to 3000 ft., but it is absent from Ceylon.

The Male bamboo flowers gregariously over large areas, and it may also be found flowering sporadically here and there every year, but, as pointed out by Gamble, such flowerings do not produce much good seed. The flowers appear between November and April. the seed ripening in June. The stems that have flowered die after the seed ripens. The leaves fall in February or March. and young new ones appear in April.

This is the most widely spread and the most useful of all the bamboos, and Gamble states that the total outturn of the Indian Forests is about 140 to 150 millions, of which at least 100 millions probably come from this species. Its culms are strong and elastic and they are used for lance-shafts, carriage-shafts, masts of small posts and rafters of temporary buildings, scaffoldings, and for the manufacture of mats of all kinds. The seed is eaten as a food-grain in times of scarcity. To the same genus belongs *D. giganteus* of Martaban. Eng. *The Giant Bamboo* a gigantic species often cultivated.

5. TEINOSTACHYUM, Munro.

Shrubby or arborescent bamboos with thin stems. Leaves like those of *Bambusa*. Inflorescence a spicate pancicle on a leaf bearing branch. Spikelets in bracteate whorls, many-flowered, upper and lower flowers imperfect. Lodicules 3 Stamens 6, filaments free, slender. Caryopsis ovoid, acuminate. beaked.

579 **T. Wightii,** Bedd, Fl. Br. Ind. vii. 310, Bedd. Fl. Syl. t. 323 Gamble Man. Tim. 75 3, Brandis Ind. Tr. 679. Tam- *Manyura*, *mai-eetla*, *chitthu*.

Leaves 6-15 in. by 1-2 in oblong-lanceolate. acuminate, unequal at base, glabrous above, sparingly hairy and white beneath, scabrous on one margin. Petiole $\frac{1}{3}$ in. Panicles lax, drooping. Spikelets $\frac{1}{2}$-1 in. long, bearing 2-3 fertile flowers and 1 terminal incomplete flower. Fruit glabrous, ending in a long beak.

A semiscandent bamboo forming an undergrowth in our evergreen forests at 3000-4000 ft. Culms 10-20 ft high and 1-1$\frac{1}{2}$ in. in diam., bright green. Internodes above 15 in.; culm-walls thin. Flowers only at long intervals and then dies down. I obtained the flowers on Fairfield Estate. Peermerd in 1887-9.

It is used by the hill-tribes for mat and basket-making and for fences.

6. OCHLANDRA, Thwaites.

Shrubby reed-like bamboos with rather large 'leaves'. Culms small, thin-walled Culm-sheaths thin, persistent. Inflorescence a terminal spike or a spicate panicle on a leafy branchlet. Spikelets in verticels, 1-flowered, often very large. Lodicules 1 or several. Stamens 6 or many, free or monadelphous. Caryopsis. Caryopsis large, ovoid, long-beaked, pericarp thick, fleshy.

Ligules short
- Filaments free, spikelets small . 1. *O. Rheedii.*
- Filaments monadelphous, spiklets very large . 2. *O. Travancorica*

Ligules long . 3. *O. Brandisii.*

1. O, Rheedii, Benth ; Fl. Br. Ind. vii 418 ; Bedd. Fl. Syl. cccxxiv ; Gamble Man. Tim. 756 ; Brandis Ind. Tr. 684. Mal *Ammei* ; *ottal* : *kolanji.* 580

Leaves 4-10 in. by $\frac{1}{2}$-$1\frac{1}{4}$ in., linear-lanceolate. acuminate, ending in a scabrous point, base rounded smooth on both sides except near the edges, one edge scabrous. Petiole very short. Ligule very short. Inflorescence a short leafy panicle on a leafy branchlet, fertile spikelets few, about 1 in. long. Lodicules many. Stamens 15 to 20. Fruit with beak 1 in. long.

A small bamboo growing in thick clumps on most of the rivers of Travancore at low elevations, only found on river banks. Culms 15 to 20 ft. high and 1 in. diam., mottled dark and pale green, very smooth ; internodes about 15 in. Found only in Malabar, Cochin and Travancore.

Flowers every year sporadically and does not die down, Much used for mat and basket making.

A variety *O. sivagiriana* with longer leaves and spikelets and more numerous stamens was found by Beddome at high elevation on the Palnies and Sivagiri Hills bordering Travancore.

2. O. Travancorica, Benth , Fl. Br. Ind. vii. 419 , Bedd. Fl. Syl. t. 324 : Gamble Man. Tim 756 Brandis Ind. Tr. 685 Tam. *Eeral : eerakalli.* Mal. *Eetta: kar-eetta, vei.* 581

Leaves 6-18 in. by 2-4in., broadly oblong-lanceolate, acuminate, apex setaceous, often scabrous : leaf-sheaths striate, the mouth furnished with several stiff bristles ligule short. Petiole $\frac{1}{3}$-$\frac{1}{2}$ in. Inflorescence a spicate panicle up to 6 ft. long, springing from the nodes of leafy branches or from the ground, the spikelets being borne at intervals of 6 in. or so. Spikelets 2-$2\frac{1}{2}$ in. long and $\frac{1}{2}$ in. broad. Lodicules 3. Stamens monadelphous, free at apex, up to 120 but usually about 50. Fruit dark green turning pale brown, smooth and shining, oval-oblong, $1\frac{1}{2}$-$2\frac{1}{2}$ in. long with a stiff beak $1\frac{1}{2}$-2 in.

A reed like gregarious bamboo common from sea-level to 5000 ft. forming an undergrowth in the evergreen forests at low elevations, and at 3000 ft and upwards covering many miles of the mountains with a dense growth to the exclusion of all other vegetation. Culms 10-20 ft. high and 1-2 in. in diam., dark-green turning to pale brown walls about 1/10 in. thick: internodes from 1-5 ft. long. Only found in the forests of Travancore and Tinnevelly.

Flowers at long intervals and dies down, but it is not certain how long the period is, because in the dry weather patches of this reed are often burnt out and appear to have died. The flowering and seeding extend over large areas, the clumps in one or more adjacent valleys flowering at the same time. A general flowering took place on the slopes about Chimunji peak in 1880-1801. When I was engaged on the boundary between Travancore and Cochin from Athirapuzha to Pannimad kutthu in 1886 I found that the eetta had seeded a year or so before, and the ground was covered with the dead culms. In 1905-6 all the reeds in the Kulathupuzha and Kallar valleys and in part of the Shendruni valley flowered. This flowering occupied at least 2 years. In the first year the culms seeded and

most of them died down, but the next year new leaves were thrown up from the roots together with long whip-like spicate panicles of flowers which in turn seeded and died down. The plant then completely died and the ground was soon covered with a dense crop of young seedlings which grew rapidly.

There is an immense demand for the culms of this reed for mats and basket making, many millions being cut every year. The hill men build very neat and clean huts of the culms and thatch them with its leaves. They last for a couple of years. Elephants live on the leaves, and horses can be taught to do so if grass is scarce. The fibre obtainable from the culms is very strong and tough, and some 25 years ago a Paper mill was built at Punalur with the object of converting the eetta-pulp into paper, for which purpose it is admirably suited. The natural colour of the paper is pale brown and it is well adapted for wrappers and cardboard but it is difficult to bleach. The enterprise failed because it was started without sufficient capital, and without a thorough enquiry into the nature of the fibre and the uses to which it was best suited, and there is no doubt but that if another attempt were made it could with the experience gained be made to pay handsomely.

582 . O. **Brandisii**, Gamble; Fl. Br. Ind. vii. 420; Gamble Man. Tim. 757; Brandis Ind. Tr. 684.

Leaves 10-20 in by $1\frac{1}{2}$-3 in., oblong-lanceolate, acuminate, ending in a twisted point, narrowed to the base, glabrous on both surfaces, whitish beneath, margins smooth, leaf-sheaths striate, fringed at the mouth with a few bristles, ligule 1 in. long. Petiole $\frac{1}{4}$ in. Inflorescence a terminal spike. Spikelets glabrous, 1-$1\frac{1}{2}$ in. by $\frac{1}{3}$ in. Lodicules 1-3. Stamens many, up to 60, filaments free. Fruit not seen.

This reed was discovered by Brandis in flower in Feb 1882 mixed with *O. Travancorica* "which it greatly resembles" on the Tinnevelly Ghauts above 3500 ft., and it will probably be found in Travancore.

Nothing is known about this species or its uses.

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* Note :—The names in italics are obsolete names or those of trees and plants not wild in Travancore.

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ADDENDA ET CORRIGENDA.

Page.	Line.	
iii	3	For ' urticaceoe ' read ' urticaceae '
iv	51	Insert ' but ' between ' of ' and ' 60 '
vi	24	For ' Anonaceoe ' read ' Anonaceae '
ix	37	For ' and ' read ' an '
ix	Note	For ' Kanjllaj's ' read ' Kanjilal's '
xiii	1	For ' seid ' read ' said '
,,	6	For ' wlthout ' read ' without '
,,	21	For ' G amopitalous ' read ' Gamopetalus '
xiv	6	For ' Hypogynus ' read ' Hypogynous '
,,	16	For ' Inferier ' read ' Inferior '
,,	,,	Insert ' the ' between ' below ' and ' ovary '
,,	22	Insert ' the ' between ' within ' and ' leaves '
,,	30	For ' papilionaceons ' read ' papilionaceous '
xv	4	For ' cambiun ' read ' cambium '
,,	36	For ' compositoe ' read ' compositae '
xvi	15	For ' thy ' read ' they '
xviii	8	For ' seeund ' read ' secund '
,,	10	For ' portio n ' read ' portion '
,,	25	For ' and ' read ' end '
xix	4	For ' subglobo se ' read ' subglobose '
xxi	36	Omit the first ' or corolliflorae '
xxiv	43	For ' onnaraceae ' read ' Connaraceae '
xxv	25	For ' bisxual ' read ' bisexual '
xxvi	12	For ' Vaccinanceae ' read ' Vaccinaceae '
,,	37	For ' Apocyanceae ' read ' Apocynaceae '
xxvii	16	For ' Myrislicaceae ' read ' Myristicaceae '
xxviii	13	For ' Sailcaceae ' rerd ' Salicaceae '
9	,,	For ' overies ' read ' ovaries '
11	3	For ' O. Zeylanica ' read ' O. zeylanica '
,,	5	For ' O. Uniflora ' read ' O. uniflora '
,,	8	For ' O. Erythrocarpa ' read ' O. erythrocarpa '
12	42	For ' Nleigherries ' read ' Neilgherries '
14	29	For ' Annota ' read ' Arnota '
15	37	For ' Racems ' read ' Racemes '
16	10	For ' Chera Kanchi ' read ' Chera kanji '
,,	15	For ' throny ' read ' ' thorny '
,,	20	Eor ' Culcutta ' read ' Calcutta '

Page.	Line.	
,,	26	For '7 as' read '6-7'
18	24	For 'glabroua' read 'glabrous'
19	4	For 'Febuary' read 'February'
,,	30	For 'Madakha' read 'Madakka'
20	4	For 'dioeis' read 'dioecious'
23	4	For 'yelow' read 'yellow'
25	9	For 'C. tomentosum' read 'C. elatum'
,,	14	For 'Pinnei' read 'Punnei'
,,	39	For 'Pinnei' read 'Punnei'
27	3	For 'Spacies' read 'Species'
29	12	For 'accumination' read 'acumination'
34	37	For 'lowly' read 'slowly'
37	12	After 'Adakka payin' add 'payin'
38	16	For 'oe' read 'of'
,,	21	For 'bettles' read 'beetles'
,,	44	For 'ef' read 'of'
40	34	For 'betwcen' read 'between'
44	15	For 'faetida 'foetida'
47	31	For 'chandabi' read 'chavandalei'
50	39	Insert 'or' between 'timber' and 'of'
58	34	For 'Taculeata' read 'T. aculeata'
61	3	Insert ',' between 'Potti' and 'Korakatta'
69	22	For 'colophoney' read 'colophony'
70	49	For 'Melia dubia' read 'M. composita'
73	19	For '20' read '200'
,,	25	For 'wood' read 'would'
74	26	For 'betwen' read 'between'
,,	45	For 'A. Roxburgiana' read 'A. odoratissima'
75	43	For '9 10' read '9-10'
77	25	For 'nd' read 'and'
,,	29	For 'poutic' read 'poultice'
,,	Note	For 'Petolules' and 'Petiolules'
78	22	For 'sed' read 'said'
,,	26	For '45' read '4-5'
80	16	For 'beatiful' read 'beautiful'
,,	17	For 'antiperiodical' read 'antiperiodic'
,,	19	For 'chuckrassia' read 'chukrasia'
82	Note	For 'chloroxylen' read 'chloroxylon'

Page.	Line.	
95	15	For 'Hemigyrasa' read 'Hemigyrosa'
,,	36	For 'Lepisanthee deficiens' read 'Lepisanth (f deficiens
98	26	Insert '2' before 'N. stipulaceum'
100	29	For 'Aprl' read 'April'
106	34	For 'cearei' read 'charei'
107	1	For 'Anardium' read 'Anacardium'
,,	16	For 'especialy' read 'especially'
,,	18	For '0 ft' read '30 ft'
108	3	For 'Peioles' read 'Petioles'
110	39	For '1022' read '10-22'
114	3	For 'pctals' read 'petals'
,,	3	For 'atamens' read 'stamens'
,,	21	For 'flowes' read 'flowers'
,,	22	For 'flowrs' read 'flowers'
,,	38	For '13 seeds' read '1-3 seeds'
115	27	For 'Po' read 'Pod'
117	13	For 'D. pacniulata' read 'D. paniculata'
118	last line	For 'Ergei' read 'Erigei'
120	43	For 'whn' read 'when'
121	5	For 'subsessible' read 'subsessile'
,,	9	For '57' read '5-7'
,,	9	For 'shinine' read 'shining'
122	12	For 'heighest' read 'height'
123	6	For 'yelowish' read 'yellowish'
124	30	For 'Laburnumi' read 'Laburnum'
124	30	For 'Konne' read 'Konnei'
127	25	For 'cutanears' read 'cutaneous'
130	39	For 'H. sp. nov.' read 'H. Bourdilloni'
,,	47	For 'banches' read 'branches'
131	18	For 'Hvahliana' read 'H. vahliana'
132	24	For '22½' read '2-2½'
134	3	For '69' read '6-9'
,,	27	For 'vatta valliparanda' read 'vattavalli, paranda'
,,	39	Insert ',' between 'Kada' and 'pangal'
141	32	For 'palcr' read 'paler'
142	44	For 'hearwood' read 'heartwood'
144	36	For 'Celon' read 'Ceylon'
146	15	For 'rettiyam' read 'rettiyan'

Page.	Line.	
147	last line	For 'Elowers' read 'Flowers'
150	13	For '814' read '8-14'
,,	18	For '1014' read '10-14'
153	6	For 'tuble read 'tube'
,,	18	For 'panciculate' read 'paniculate'
,,	25	For 'T. cotappa' read 'T. catappa'
157	43	For '5060' read '50-60'
161	10	For 'E. rottlriana' read 'E. rottleriana'
169	22	For 'Westsrn' read 'Western'
170	13	For 'Samuthraceham' read 'Samuthraccham'
171	2	For 'durables' read 'durable'
174	36	For 'capsuls' read 'capsules'
,,	38	For 'circumscis' read 'circumsciss'
,,	42	For 't be' read 'tube'
177	40	For '410' read '4-10'
179	38	Omit 'add endemic and rare'
,,	42	For 'Bank' read 'Bark'
182	29	For 'brnad' read 'broad'
,,	42	For 'acroes' read 'across'
184	34	For 'petioe' read 'petiole'
185	35	For '49' read '4-9'
,,	39	For 'horney' read 'horny'
189	13	For 'distinguihable' read 'distinguishable'
,,	29	For 'siender' read 'slender'
193	4	For 'calyx-imb' read 'calyx-limb'
,,	5	For 'shor' read 'short'
,,	6	For '2-celle' read '2-celled'
,,	12	'axilary' read 'axillary'
,,	22	For 'frests' read 'forests'
196	10	For 'Edemic' read 'Endemic'
,,	21	For 'smll' read 'small'
,,	22	For 'smll' read 'small'
,,	29	For 'serviceabl' read 'serviceable'
199	28	For 'Tama' read 'Tamil'
200	36	For '1'12 'read '1'/12
201	22	For 'V. Leschenaulti' read 'V. Leschenaultii'
202	1	For 'schols' read 'sholas'
203	18	For 'endospem' read 'endosperm'
,,	23	For 'racems' read 'racemes'

Page.	Line.	
,,	27	For 'racems' real 'racemes
204	12	For 'allen' read 'fallen'
207	11	For 'Mexice' read' 'Mexico'
208	20	For 'evergreeu' read 'evergreen'
209	15	For 'axlis' read 'axils'
,,	21	For 'B. langifolia' read 'B. longifolia'
,,	23	For 'B. f lva' read 'B. fulva'
,,	40	For 'seys' read 'says'
,,	,,	For 'Bank' read 'Bark'
211	2	For 'leave' read 'leaves'
,,	15	For 'ehoppala' read 'choppala'
,,	43	For 'gibrous' read 'glabrous'
212	3	For 'solitory' read 'solitary'
,,	41	For 'b' read 'by'
213	31	For 'Diospyos' read 'Diospyros'
,,	40	For '316' read '3-16'
214	15	For 'rathe' read 'rather'
,,	20	For 'corolls' read 'corolla'
214	31	For 'Eusperm' read 'Endosperm'
,,	last line,	For '1624' read '16-24'
215	11	For 'D.bourdllonl' read 'D. bourdilloni'
216	7	For 'endesperm' read 'endosperm'
,,	47	For 'recticulate' read 'reticulate'
218	26	For 'vary to' read 'to vary'
221	2nd line in the note,	for 'speoies' read 'species'
222	36	For 'gray' read 'grey'
223	2	For 'D.calycyna' read 'D.calycina'
,,	17	For 'vissible' read 'visible'
,,	17	For '15' read '1-5'
,,	28	For 'staminods' read 'staminodes'
224	20	For 'Karuthuvara' read Karunthuvara'
,,	33	For 't' read 'ft'
,,	45	For 'D.sucata' read 'D.sulcata'
225	42	For 'sc' read 'so'
226	2	For 'densly' read 'densely'
,,	26	For 'overy' read 'ovary'
227	30	For 'Kamby' read 'Kambli'
,,	33	For 'shinning' read 'shining'
234	23	For 'diarrhea' read 'diarrhoea'
,,	37	For '816' read '8-16'
238	7	For 'Collecction' read 'Collection'

Page.	Line.	
239	39	For '5-2' read '5-8'
,,	39	For '58' read '5-8'
241	8	For 'jn' read 'in'
,,	16	For 'small' read 'small'
,,	26	For '56' read '5-6'
,,	last line	For 'Travancere' read 'Travancore'
242	12	For 'interminal' read 'in terminal'
,,	25	For 'eptum' read 'septum'
,,	32	For 'moro' read 'more'
,,	4	For 'Pajnelia D' read 'Pajanelia D. C.'
,,	13	For 'p iyani' read 'paiyani'
,,	29	For 'lare' read 'large'
247	6	For '24' read '2-4'
,,	15	For 'V. leucoxylo' read 'V. leucoxylon'
247	18	For 'Mayjleu' read 'mayilelu'
,,	46	For 'petoile' read 'petiole'
249	21	For 'calvax' read 'calyx'
,,	37	For 'f' read 'ft'
250	37	For 'ls' read 'is'
,,	41	For 'youg' read 'young'
251	8	For '201' read '2·01'
,,	17	For 'inereases' read 'increases'
252	21	For 'Coscus Cadamboe' read 'Cossus Cadamboe'
,,	32	For 'doveloped' read 'developed'
253	3	For 'sapply' read 'supply'
,,	3	For 'as' read 'is'
,,	35	For '13 to 14¾' read '10 to 14¾'
254	3	For 'Pergilei' read 'Perugilei'
,,	16	For 'hy' read 'by'
255	5	For 'ln' read 'in'
258	4	For '1214' read '12-14'
,,	4	For 'acuta' read 'acute'
259	5	For 'issue' read 'tissue'
,,	33	For 'M. Faraquhariana' read 'M. Farquhariana'
260	17	For 'adove' read 'above'
261	11	For 'Cinnamom' read 'Cinnamon'
,,	35	For 'anthes' read 'anthers'
,,	36	For 'extrose' read 'extrorse'
,,	40	For 'glucous' read 'glaucous'
,,	40	For 'obstuse' read 'obtuse'
,,	40	For 'petiol' read 'petiole'
262	6	For 'te' read 'to'
,,	10	For 'evn' read 'even'

Page.	Line.	
„	29	For '2-called' read '2-celled'
„	33	For 'A. Arnotti' read 'A. Arnottii'
„	36	For 'ma ure' read 'mature'
263	11	For 'l-in' read '1 in'
„	11	For 'racemos' read 'racemes'
„	11	For 'slky' read 'silky'
„	11	For 'flaments' read 'filaments'
268	19	For '6·1' read '6-10'
„	20	For 'ubescent' read 'pubescent'
264	18	For 'panicle' read 'panicles'
„	24	For '6,8 in' read '6-8 in'
„	27	For 'ln' read 'in'
265	2	For 'thikened' read 'thickened'
„	46	For 'equidistant' read 'equidistant'
266	9	For 'add' read 'and'
„	12	For 'C:graeile' read 'C.gracile'
„	35	For 'specillen' read 'specimen'
„	39	Omit the second 'extending'
„	48	For '1 1½' read '1-1½'
267	10	For 'liner'-lanceolate' read 'linear-lanceolate'
269	16	For 'L.stoeksii' read 'L.stocksii'
270	42	For 'Annua' read 'Annual'
871	38	For 'tripli-nerved' read 'triple-nerved'
272	18	Omit 'in' before 'anthers'
273	35	For 'nvolucre' read 'involucre'
275	31	For 'evently' read 'evenly'
276	11	For 'ae' read 'are'
277	46	For 'Figi' read 'Fiji'
„	50	For 'thee' read 'there'
278	34	For 'lees' read 'less'
„	40	For 'indiagenous' read 'indigenous'
279	30	For '3 8' read '3-8'
„	34	For 'Peta spresent' read 'Petals present'
„	54	For 'uuited' read 'united'
„	57	For 'Cledian' read 'Cleidion'
280	10	For 'augles' read 'angles'
„	38	For 'bsrk' read 'bark'
281	25	For 'Nalachithiyan' read 'Malachithiyan'
„	46	For 'constructien' read 'construction'
283	21	Inser 'in' between 'uncommom' and 'dry'
„	23	For 'known' read 'know'
234	5	For '2 5-celled' read '2-5 celled'
„	10	For 'Muttatharai' read 'Muttathurai'

Page.	Line.	
284	13	For 'racemos' read 'racemes'
,,	31	For 'fn' read 'in'
,,	44	For 'spike' read 'spikes'
285	3	For 'Frults' read 'Fruits'
,,	15	For 'branch' read 'branched'
286	7	For '3-7s' read '3-7'
,,	21	For 'A. Ghaesembila' read 'A. Ghaesembilla'
288	37	For '400 ft' read '4000 ft'
289	14	For 'H. tranvaneorica' read 'H. travancorica'
290		Last but one line. For 'a widespreading' read 'widespreading'
291	27	For 'uuknown' read 'unknown'
,,	31	Insert 'in' between 'calyx' and 'male flowers
,,	39	For 'ovai' read 'oval'
292	33	For 'yovar' read 'ovary'
,,	41	For 'neneath' read 'beneath'
,,	43	For 'throoughout' read 'throughout'
293	35	For 'nsually' read 'usually'
294	19	For '24' read '2-4'
,,	38	For '2025 ft' read '20-25 ft'
295	39	For 'ghuts' read 'ghauts'
296	37	For 'Thavat tapolavu' read 'Thavatta polavu'
,,	40	For 'seaceous' read 'setaceous'
297	12	For 'roughs' read 'rough'
,,	42	For 'flowerss' read 'flowers'
298	12	For 'owers' read 'flowers'
,,	22	For 'Cafamarans' read 'Catamarans'
,,	38	For 'ng' read 'long'
299	18	For 'wooly' read 'woolly'
300	3	For 'ovay' read 'ovary'
,,	14	For 'lgand' read 'gland'
,,	45	For 'Sorcoclinium' read 'Sarcoclinium'
301	3	For 'staff' read 'stiff'
,,	17	For 'inciined' read 'inclined'
303	12	For 'Flower' read 'Flowers'
303	12	For 'femele' read 'female'
,,	14	For 'galbrous' read 'glabrous'
304	1	For 'Cordamom' read 'Cardamom'
,,	17	For 'lacearte' read 'lacerate'
,,	33	For 'achinate' read 'echinate'
305	29	For '26' read '2·6'
,,	31	For '½1' read '½-1'
306	10	For 'cl se' read 'close'
,,	34	For 'dntate' read 'dentate'

Page	Line.	
307	1	For '24' read '2-4'
,,	6	For 'kumpil' read 'kumbil'
,,	7	For 'malamkumpil' read 'malamkumbil'
,,	7	For 'naikumpil' read 'naikumbil'
,,	33	For 'uually' read 'usually'
,,	35	For '34' read '8-4'
308	16	For 'takring' read 'taking'
309	17	For '3-vein d at bas' read '3-veined at base'
,,	18	For 'convolate' read 'convolute'
,,	19	For 'valocate' read 'valvate'
310	7	For 'erect i bud' read 'erect in bud'
,,	37	For '(under dysdoxylon)' read '(under C. dysdoxylon'
,,	38	Omit 'bhutha' between 'Bhutha' and 'bhutha onatthi'
,,	46	For 'heigt' read 'height'
311	3	For 'dull' read 'dull'
,,	31	For 'glbrous' read 'glabrous'
,,	31	For 'beakedt' read 'beaked'
,,	45	For 'induplicate-valate' read 'induplicate-valvate'
312	40	For 'Mal' read 'Male'
313	41	For 'F. Dalhonsiae' read 'F. Dalhousiae'
,,	47	For 'nevers' read "nerves"
315	14	For 'pedncles' read 'peduncles'
316	15	For 'hranches' read 'branches'
317	27	For 'reeeptacles' read 'receptacles'
,,	33	For ffrm' read 'firm'
319	2	For 'accumination' read 'acumination'
319	Last line.	For 'Ntr-al' read 'Nir-al'
320	5	For '½1' read '½-1'
321	3	For 'Ama kanni an' read 'Ama kanniyan'
,,	30	For '0-300 ft.' read '0-3000 ft.'
322	26	For 'stipuls' read 'stipules'
323	45	For 'densly' read 'densely'
324	19	For '¾ 2 in' read '¾-2 in.'
325	35	For 'growh' read 'growth'
326	16	For 'yer' read 'per'
,,	45	For '1 ½ in' rerd '18½ in'

Page.		
328	1	For '4. Plecospermum' read '3. Plecospermum'
329	18	For 'effuivium' read 'effluvium'
331	28	For 'flowsrs' read 'flowers'
,,	33	For '(under Oreoenide sylvatica)' read 'under (Oreocnide sylvatica)'
,,	Last line.	For 'lo' read 'to'
332	Last but one line	For 'one trees' read 'one tree'
333	9	For 'towards tip tip' read 'towards the tip'
,,	32	For 'jojntd' read 'jointed'
,,	33	For 'ef' read 'of'
,,	37	For 'arms filiforms' read 'arms filiform'
334	1	For 'cylindrical of' read 'cylindrical or'
336	12	For 'Confierae' read 'Coniferae'
337	1	For 'tin colourless juice' read 'thin colourless juice'
,,	15	For 'petiolese' read 'petioles'
338	15	For 'axilary' read 'axillary'
,,	28	For 'vields' read 'yields'
340	9	For 'Catchu' read 'Catechu'
342	17	For 'horse hairs-like' read 'horse hair-like'
,,	19	For '(A. succharifera)' read '(A. saccharifera)'
345	4	For 'ctting' read 'cutting'
,,	26	For '18 30 in' read '18-30 in'
,,	30	For 'obovid' read 'obovoid'
,,	37	For 'swollen near the tree' read 'swollen near the base'
,,	45	For 'stemps' read 'stems'
346	18	For 'tabular' read 'tubular'
347	13	For 'heathing' read 'sheathing'
"	14	For 'Serminal' read 'terminal'
,,	15	For 'perianath' read 'perianth'
,,	41	For 'Keoro oil' read 'Keora oil'
348	4	for the first 'thc' read 'the'
,,	12	For 'super' read 'superior'
,,	26	For 'qf' read 'of'
,,	33	For 'see' read 'seed'
349	1	For '8 12 years' read '8-12 years'
350	2	For 'ieaves' read 'leaves'

Page	Line	
,,	16	For ' A. denstifolia ' read ' A. densifolia '
,,	Last but one Line.	For ' acumlnate ' read ' acuminate'
351	21	For ' th ' read ' the '
,,	28	For ' the bamboo fores is ' read ' the bamboo forest which is '
,,	25	For ' Consequencc . read ' Consequence '
352	16	For ' glabraus ' read ' glabrous '
,,	38	Delete ' diam ' between 'in' and 'a twisted point'
354	54	Delete the first 'caryopsis'

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